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EFFECTS OF TIME, SEED SOURCE, AND PLANT COMPOSITION ON MACROINVERTEBRATES IN RESTORED PRAIRIE

by

Benjamin Randall Wodika

B.S., Western Illinois University, 2003
M.S., Western Illinois University, 2006

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctor in Philosophy

Department of Plant Biology
in the Graduate School
Southern Illinois University Carbondale
August 2015

DISSERTATION APPROVAL

EFFECTS OF TIME, SEED SOURCE, PLANT COMPOSITION ON MACROINVERTEBRATES IN RESTORED PRAIRIE

By

Benjamin Randall Wodika

A Dissertation Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy

in the field of Plant Biology

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AN ABSTRACT OF THE DISSERTATION OF

BENJAMIN R. WODIKA, for the Doctor of Philosophy degree in PLANT BIOLOGY, presented on December 12, 2014, at Southern Illinois University at Carbondale.

TITLE: EFFECTS OF TIME, SEED SOURCE, PLANT COMPOSITION ON MACROINVERTEBRATES IN RESTORED PRAIRIE

MAJOR PROFESSOR: Dr. Sara G. Baer

Invertebrates influence primary productivity and nutrient cycling in ecosystems. They are also important links between producer and higher trophic levels. Despite their important role in terrestrial ecosystem function, invertebrates are frequently overlooked in ecological restorations. Thus, the objective of this research was to quantify how belowground macroinvertebrate ecosystem engineers and communities change over time following ecological restoration and examine whether the source of dominant plant species and the composition of non-dominant plant species influence aboveground macroinvertebrates community structure in restored prairie.

A chronosequence design (space for time substitution) was used to determine the role of restoration age, plant community, and soil structure on the recovery of two belowground macroinvertebrate ecosystem engineers (Chapter 2). Ants and earthworms were sampled from cultivated fields, grasslands restored for 1-21 years, and native prairie. Earthworm abundance increased with time since cessation of cultivation, concomitant with prairie establishment. The abundance and biomass of ants were more related to the structure of restored plant communities than time since restoration. The dominance of exotic earthworms, and a generalist ant species in these restorations, coupled with their known capacity to alter soil properties and processes, may represent novel conditions for grassland development.

The same chronosequence of agricultural fields, restored prairies, and prairies that were never cultivated was used to address the second objective of this research, which was to quantify

how the belowground macroinvertebrate community composition changed in response to ecological restoration and whether the communities became representative of undisturbed ("target") communities. Macroinvertebrate communities in the two remnant prairie sampled were distinct from restorations and continuouslycultivated fields. The macroinvertebrate communities in prairie that had never been cultivated were also distince from each other, indicating a "target" community is hard to define. Belowground macroinvertebrates changed in a trajectory that was not representative of either remnant prairie, but was representative of the an average of both remnant prairies. Thus, if you reconstruct prairie from cultivated soil conditions ("build it"), macroinvertebrates will colonize ("come"), but attaining a community representative of a specific target may require introduction from that target.

Colonization of macroinvertebrates in restorations aboveground are most likely to be influenced by aspects of the plant community. A third objective of this research was to quantify whether variation in dominant species (cultivars vs. local ecotypes) and composition of subordinate species (local species pools) influence the composition of aboveground macroinvertebrates. Macronvertebrate abundance, richness, diversity, trophic groups and community composition in late summer did not vary between prairie restored with cultivar and local ecotypes of the dominant grasses. This was observed in two field experiments. The species pool treatment did influence the macroinvertebrate community, as one species pool had slightly higher morphospecies diversity and hymenopterans that the other two species pools. This was likely due to the presence of an ant-tended legume, *Chamaecrista facsciculata* Michx., in one species pool.

Overall, this research demonstrates that time since the cessation of disturbance (cultivatation) and plant communities influence macroinvertebrate communities in restored

prairie. Restored prairies in the Midwest are likely to be colonized by exotic earthworms and cosmopolitan ants. More research is needed to reveal how they influence ecosystem functioning.Belowground, macroinvertebrate communities may not represent restoration "targets" and these "targets" may be hard to define if remnants are rare or there is a high degree of spatial variation on the landscape. Variation in plant communities above ground appears to influence the structure of aboveground macroinvertebrate communities more than variation within dominant species. Whether this aboveground variation is reflected is reflected belowground deserves further investigation.

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Carbondale – Carbondale and SIU will always have a special place in my heart. I was married, did a PhD, and had a child here. Whoa, that is a lot of living spent in the ‘Dale! Once again- thanks to everyone who has supported me on this journey!!!!!

PREFACE

Chapter two is a modification of the publication listed below. My contribution to this manuscript included the experimental design, data collection, sample processing, data analysis and interpretation, and writing the manuscript that provided context to the field of restoration ecology.

Wodika, B.R., Baer, S.G., and Klopf, R.P. 2014. Colonization and Recovery of Invertebrate Ecosystem Engineers during Prairie Restoration. *Restoration Ecology* 22(4): 456-464.

Chapter three is a modification of the publication listed below. My contribution to this manuscript included the experimental design, data collection, sample processing, data analysis and interpretation, and writing the manuscript that provided context to the field of restoration ecology.

Wodika, B.R., and Baer, S.G. 2015. If we build It will they colonize? A test of the field of dreams paradigm with soil invertebrate communities. *Applied Soil Ecology* 91: 80-89

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CHAPTER 1

INTRODUCTION

Grasslands historically covered ~ 40% of Earth's terrestrial surface. During the Holocene, these extensive ecosystems were frequently modified by grazing and fire but were largely intact from low intensity human disturbance. In the last 150 years, grasslands have experienced a severe global decline in extent, including the tallgrass prairie of central North America (Anderson 2006; Gibson 2009). Tallgrass prairie is a highly endangered ecosystem that once blanketed 162 million hectares over twelve states and one Canadian province. Tallgrass prairie provides numerous ecosystem services including erosion control, habitat for a diversity of wildlife including non-game species such as pollinators and migratory songbirds, and may even provide an important long term sink for carbon (Gibson 2009). Grasslands are also important for water infiltration, nutrient cycling, control of agricultural pests, and offer an unrealized potential for sustainable food production (Costanza et al. 1997; Ruechel 2006; Maczko and Hidinger 2008). Invertebrates play an important role in mediating some of these key ecosystem services (Losey and Vaughan 2006).

Beginning with the homesteaders of the early 1830's, approximately 82-99% of the tallgrass prairie has been converted to row crops and intensive agriculture. These losses were especially severe in Illinois and surrounding states where less than 0.01% of this grassland remains (Samson and Knopf 1994). Tallgrass prairie is a disturbance dependent ecosystem and the loss of a keystone grazer (*Bison bison*), and fire suppression, in addition to habitat fragmentation and invasive species have accentuated this decline (Samson and Knopf 1994; Robertson et al. 1997; Knapp et al. 1999; Samson et al. 2004).

The first prairie restoration was performed in 1936 at the University of Wisconsin's Arboretum with the assistance of Aldo Leopold and the Civilian Conservation Corps (Sperry 1994; Packard and Mutel 1997). In recent years, prairie and grassland restoration has been commonly performed by conservation organizations such as The Nature Conservancy (TNC), private landowners, and the federal government through the Conservation Reserve Program (Packard and Mutel 1997). The 1985 Food and Security Act created the Conservation Reserve Program (CRP) with the intent to stabilize soil, but the program has since expanded to promote native species habitat in addition to the primary goal of soil stabilization on highly erodible land (Skold 1989). Jones-Farrand et al (2007) estimated over 26 million acres of grassland were established through the CRP grassland as of 2005, making this one of the most extensive successful grassland restoration programs. Most CRP plantings are functional restorations planted with the dominant prairie grasses that occasionally include legumes (Baer et al. 2002; Sluis 2002).

Ecological restorations performed by non-governmental organizations (NGOs) and some private land owners often aim to establish a plant community reminiscent of a pre-settlement condition with a greater range of biological richness (Hobbs and Harris 2001). Grasslands restored through the CRP program have been successful at restoring some of the functional aspects of prairies, but attaining a resilient plant community reminiscent of native prairie has been elusive. As restorations mature, the C_4 grasses generally dominate at the expense of native forbs and subdominant grasses that contribute the most to the floristic diversity of native prairie (Kindscher and Tieszen 1998; Baer et al. 2002; Sluis 2002; Camill et al. 2004).

Previous studies in grassland restorations have examined the recovery trajectories of the plant community (Baer et al. 2002; Sluis 2002), but few studies have examined the response of

aboveground and belowground macroinvertebrates. Functional aspects of restorations such as aboveground net primary productivity and biogeochemical processes have been shown to recover faster (Baer et al. 2002) than plant and invertebrate community structure (Meyer and Whiles 2008). If a restoration aims to restore the full range of ecosystem functions and processes, multiple trophic levels should be considered (Whiles and Charlton 2006; Majer et al. 2007).

Role of Invertebrates in Ecosystems

Invertebrates have been shown to influence ecosystems directly and indirectly through herbivory, decomposition, predation, pollination, and as links to higher trophic levels (Whiles and Charlton 2006). Invertebrates can also alter successional trajectories of terrestrial vegetation. Despite their tight association with ecosystem function and composition, these organisms are rarely studied in recovering systems. Thus, understanding the role of invertebrates in recovering systems is essential to restoration ecology.

Invertebrate herbivory can have a substantial influence on the plant community. Insects can consume 50 to 150% of their body mass in a day; grasshoppers consume ~5% of aboveground net primary productivity (ANPP) (Meyer et al. 2002). In response to herbivory, plants can alter the tissue quality (C: N ratio) of leaves and roots (Blossey and Hunt-Joshi 2003; Wardle et al. 2004; Newingham et al. 2007). In addition to altering the tissue chemistry, herbivory can reduce the biomass of target plants if heavily grazed, but some studies suggest that light or moderate herbivory may even stimulate plant production via compensatory growth (Thomson et al. 2003). These direct effect(s) of herbivory may influence varies levels of

biological hierarchy by altering individual plant success, plant community composition, and even ecosystem processes (Belovsky and Slade 2000; Whiles and Charlton 2006).

The direct effects of invertebrate herbivory in grasslands are evident, but indirectly these consumers can also affect grassland functioning through their effects on nutrient cycling and energy flow to higher trophic levels. Herbivores can increase nutrient cycling rates by removing and returning recalcitrant plant biomass to the detrital pool as labile nutrient-rich excrement (Swank et al. 1981; Seastedt and Crossley 1984). Belovsky and Slade (2000) documented grasshoppers that fed on low quality grasses and the associated acceleration of nutrient cycling in a Palouse prairie. In some instances, frass is lower in available nutrients relative to plant litter and nutrient cycling may slow (Pastor and Cohen 1997). Additionally, an herbivore's ability to discriminate among plant species may be based on leaf chemistry. Hence, plant species that are relatively unpalatable may be avoided by herbivores. If recalcitrant plants are avoided, but palatable ones are preferentially grazed, the remaining species have litter that is decomposed more slowly, resulting in a deceleration of nutrient cycling (Hobbie 1992; Pastor and Cohen 1997; Ritchie et al. 1998; Siemann et al. 1998). This phenomenon was observed in a Minnesota oak savanna where herbivores indirectly increased the abundances of an unpalatable legume and woody species, thus decelerating nutrient cycling (Ritchie et al. 1998). Whiles and Charlton (2006) suggest nutrient accelerators and decelerators may be species specific, variable in time and space, and may ultimately have a neutral effect.

Bottom up Control of community structure

Identifying and understanding mechanisms of species richness patterns is an active area of inquiry for ecologists (Wright 1983; Stevens and Carson 2002; Hurlbert 2004; Evans et al.

2005b). Recognizing these mechanisms can also be useful for the recovery of insect populations. For example, a larger resource base is predicted to support more consumer groups than a smaller resource base. By understanding the mechanisms by which consumer populations respond to plant resources, restoration practitioners can manipulate the plant community and influence the consumer population. The 'available energy hypothesis' (Evans et al. 2005b) and the 'environmental heterogeneity hypothesis' (citation) are two hypotheses frequently invoked to explain bottom-up control of community structure.

Energetic hypotheses are frequently cited to explain the positive relationships observed between energy availability and species richness (Evans et al. 2005b). Energetic mechanisms are dependent on the thermodynamics of energy transfers as solar energy is captured by primary producers and diffused through a reticulate food web (Lindeman 1942; Polis and Strong 1996). The 'more individuals hypothesis' (also known as the 'increased population size hypothesis') is the most commonly cited available energy hypothesis mechanism (Hurlbert 2004; Evans et al. 2005a). These hypotheses predict that high energy areas have a greater abundance of resources and can support larger populations of consumers which buffers them from local extinction events (Wright 1983; Evans et al. 2005b). Diversity-energy studies are often criticized for ignoring habitat complexity and other covariates in studies that examine species richness in gradients ranging from deserts, grasslands and forests (Hurlbert 2004).

Environmental heterogeneity is an alternative bottom up mechanism with potential to explain patterns in species richness. The 'environmental heterogeneity hypothesis' predicts that species richness will be increased due to niche partitioning of spatially and temporally heterogeneous resources, thereby preventing competitive exclusion by one or a few dominant species (Macarthur 1964). Plant community structure was found to be influenced by soil resource

heterogeneity in an experimental Kansas prairie restoration (Baer et al. 2005). Nielsen et al. (2010) found that belowground invertebrate species richness increased with experimental manipulation of small scale heterogeneity in the UK. Aboveground support of the heterogeneity hypothesis was found by Jonas et al. (2002) where Orthoptera were responsive to structural diversity and management of grasslands sites in Kansas.

Role of Belowground Invertebrates in Ecosystems

Belowground communities are typically detritivorous and thus differ from aboveground communities that are reliant on carbon from living biomass (Hooper et al. 2000; Wardle et al. 2004; Bonkowski et al. 2009). Though often overlooked, soil invertebrates mediate key ecosystem services such as water infiltration, nutrient cycling, pedogenesis/decomposition, energy flow, primary productivity, and regulation of soil greenhouse gas emissions. Despite the importance of these organisms to soil structure and function, they have been historically understudied due to a lack of standardized sampling procedures, a deficiency of taxonomic expertise, and difficult experimental design (Brussaard et al. 1997; Lavelle et al. 1997; Hunter 2001; Wardle et al. 2004; Bonkowski et al. 2009). Bottom-up control of belowground invertebrates has been shown to be mediated by the quality rather than the quantity of belowground plant biomass (Milcu et al. 2006). Given that tallgrass prairies have 60-90% of their plant biomass belowground, the study of soil fauna in this ecosystem clearly merits further research.

Manipulating the soil invertebrate community has been shown to shape the aboveground community, and may have a greater impact on plant performance than foliar feeders (Reichman and Smith 1991; Masters et al. 1993; De Deyn et al. 2004; Wardle et al. 2004). Selective

herbivory by root feeding insects has the potential to alter the plant community and modify the competitive balance of dominant plant species (Brown and Gange 1992). Further, plant community richness may be lowered as fewer plant species are able to recruit into the aboveground community (Brown and Gange 1992; Gange and Brown 2002).

As ecosystem engineers, earthworms (Lumbricidae) and ants (Formicidae) modulate the supply of soil resources for other species by the formation of biogenic structures such as burrows and mounds, respectively (Jones et al. 1994; Jouquet et al. 2006). Most earthworms (Oligochaeta) can be classified as accidental engineers, as their feeding and excretion activities create structures that have no direct effect on their fitness (Jouquet et al. 2006). The importance of earthworms is primarily due to their active incorporation of soil organic matter into microaggregates within stable macroaggregates (Bossuyt et al. 2004, 2005). James (1991) found that earthworm casts contributed a substantial amount of plant available nitrogen, and that native earthworms contribute more to soil processes than exotic species in a native grassland. Further, the drillosphere created by the burrowing activity is considered a microbial "hotspot" where a significant amount of carbon and nitrogen mineralization occurs (Lavelle 1988; Parkin and Berry 1999). The mechanical mixing of these soils can cause homogenization depending on the populations of epigeic (surface dwelling), endogeic (mineral soil dwelling), and anecic (vertical burrowers) feeders (Darwin 1881; Edwards 1996; Butt 1999).

Unlike earthworms, ants are considered to be intentional engineers as their mounds mediate the soil microclimate directly impacting their fitness (Jouquet et al. 2006). Redistribution of soil particles is of particular importance to their status as ecosystem engineers. This bioturbidation results in a homogenized mound soil profile due to an abundance of small mandible sized soil particles that influence bulk density, water infiltration, temperature, and soil

moisture (Beattie and Culver 1977; Dostal et al. 2005; Jouquet et al. 2006). These mounds can be described as "islands of fertility" due to their enhanced nutrient status (i.e. nitrogen, phosphorus, and potassium) from accumulation of stored food, feces, decomposition, and aphid honeydew (Lavelle et al. 1997; Dostal et al. 2005; Lane and BassiriRad 2005). Although most studies have documented higher nutrient levels in mound soil, Dostal (2005) found decreased levels of nitrogen, magnesium, calcium, and carbon. Likely causes of lower nutrient status relative to surrounding soils include the loss of carbon through mineralization, the addition of low nutrient soil from deep within the soil profile, and the active removal of organic matter by these organisms (Holec and Frouz 2006). These changes in soil structure and fertility have been shown to influence root structure, mycorrhizal colonization, and may increase plant community heterogeneity (Beattie and Culver 1977; Dauber et al. 2008).

Invertebrate successional dynamics

Early colonizing invertebrates are generally small aerial plankton such as thrips (Thysanoptera), or large winged insects such butterflies (Lepidoptera), bees (Hymenoptera: Apoidea), and ground beetles (Coleoptera: Carabidae). Successful early colonists are typically multivoltine "r" selected generalists with high fecundity (Corbet 1995; Tscharntke and Greiler 1995). Hokkanen and Raatikainen (1977) suggest insect species accumulate rapidly in the first years of succession as the grassland community is developing from an annual forb dominated early successional sere to a mixture of perennial grasses and forbs found in mid-successional fields (Southwood et al. 1979; Brown 1985). Parrish and Bazzaz (1979) found the insect community structure to vary during different successional stages of Illinois prairies. Smaller bees (Hymenoptera), and flies (Diptera) with short tongues were common early in succession, while larger bees and butterflies of conservation interest with longer tongues that rely on nectar resources were more common in

fields and remnant prairies. Siemann et al. (1999) suggests herbivore size should decrease as niche partitioning increases and as insect species accumulate that are capable of specializing on later successional plants that are less palatable and better defended.

A greater variety of plant species resources are available with greater plant richness (Macarthur 1964; Siemann et al. 1999). Increases in plant richness associated with succession also positively influence the structural diversity of the plant community, and subsequently microhabitats for a diverse array of insects. Structural diversity can be characterized by its spatial and architectural components that are important to many groups of insects (Southwood et al. 1979). For example, Jonas et al. (2002) found grassland structure, as mediated by management history, was important to Coleoptera and Orthoptera community structure.

Terrestrial insect community structure is likely controlled by the availability of resources (bottom-up control) and the abundance of predators (top-down control) (Southwood et al. 1979; Siemann 1998; Carson and Root 1999; Siemann et al. 1999). Nemec and Bragg (2008) found restored prairies in Nebraska contained comparable insect diversity to remnants, but importantly Cicadellidae, Fulgoridae, Membracidae, Acrididae, and Tettigoniidae were lacking due to their dependence on specific plant hosts. Examination of Araneae and Hemiptera in previously mined Eucalyptus forests have shown a faster recovery and a predictable successional trajectory that converges on un-mined forests when seeded with a diversity of forest species relative to unseeded controls (Majer and Nichols 1998; Majer et al. 2007). Summerville (2007, 2008) found moth abundances to be highly variable temporally, but detected a trend where older restorations were converging on remnant Lepidopteron community structure. Interestingly, a forb-rich 10 year old restoration had the highest species richness which lends support to the importance of insect dependence on host plants (Summerville et al. 2007). It is important to consider that

similarities between remnants and restorations could be driven by species gain in restorations or may be an artifact of species loss in small fragmented remnants (Leach and Givnish 1996; Summerville 2008).

Soil invertebrates can influence plant community succession and are in turn influenced by the resultant plant community. Brown and Gange (1992) found soil insects increased the rate of succession due to root herbivores suppressing annual and perennial forbs during the first four years of succession. De Deyn (2003) documented a similar pattern, where the roots of the dominant early successional species were selectively grazed increasing the abundance of later successional plant species. Application of soil insecticide demonstrated top down effects of soil insects on the developing plant community by altering competitive relationships of the dominant plant species (Schadler et al. 2004). Gange and Brown (2002) also found the impacts of soil insects on plant community structure and successional rate were strongly influenced by the presence of mycorrhizal fungi. In addition to altering successional trajectories and competitive relationships, ant mounds created hotspots of higher total N, dissolved N, and NH_4. This nutrient-enriched soil was transitory as the total N of the field increased with restoration, thus the distinctiveness of these mounds decreased with restoration age (Lane and BassiriRad 2005).

Soil invertebrates are considered to be primarily controlled by bottom up processes, and thus the development of a soil macroinvertebrate insect community is expected to track the development of the plant community (Scheu and Schaefer 1998). In a 120,000 year chronosequence of the Franz Josef Glacier in New Zealand, distinct vegetation build-up and retrogression phases were identified that corresponded to nutrient limitation. Soil invertebrates had a similar pattern; diversity of most groups tended to increase with the vegetation build-up phase, and decline during the vegetation retrogression stage. Much as the vegetation was

controlled by nutrient limitations, soil invertebrates were also responsive to the ratios of soil C, N, and P (Doblas-Miranda et al. 2008).

Over shorter time scales, soil community diversity and richness have been shown to increase with restoration age, but successional trajectories differ between grasslands recovering from nutrient enrichment, and those recovering from tillage. Isopoda, Chilopoda (centipede), and Diplopoda (millipede) diversity tended to increase with restoration age, in Netherlands grasslands recovering from fertilization, but the oldest site at 29 years post fertilization had fewer macroinvertebrates, and lower diversity (Berg and Hemerik 2004). A similar trend was found where most groups of macroinvertebrates showed no response to nutrient levels, but weevils (Curculionidae) did respond to enrichment when examined at the species level (Hemerik and Brussaard 2002).

In Netherland grasslands undergoing secondary succession from row crop agriculture, plant community structure developed toward reference communities, but the nematode trajectory showed no clear development (Kardol et al. 2005). A similar trend was found in communities of Collembola of North American reconstructed and native tallgrass prairies, where the springtail richness at the oldest sites was similar to the native sites. It is important to note that while richness at the oldest reconstruction converged on that of the native prairie, Collembolan community structure was different. In bauxite mined forests of Australia, insect communities appeared to be recovering, and have a predicted successional trajectory that will converge on that of the un-mined forests (Majer et al. 2007).

Overall Objectives

The overall objective of this dissertation was to understand how time, plant seed source, and plant composition influence macroinvertebrates in restored prairies. In Chapter 2, I addressed three objectives regarding the role of time, plant community structure, and soil properties on the recovery of the abundance and biomass of ants and earthworms. First, the recovery rates of ants and earthworms were assessed to ascertain whether the composition of each group became representative of native prairie. Second, I aimed to elucidate whether recovery of soil invertebrates was related to ecosystem properties and processes. The third objective was to evaluate whether recovery of soil invertebrates was related to ecosystem properties and processes. The objective of Chapter 3 was to understand how the belowground invertebrate community structure (diversity, taxonomic, and trophic levels) changes in a chronosequence of prairie restoration. The role of "target" communities in recovering systems was investigated as these are potentially important for restoration practitioners to consider. In Chapter 4, I examined the role of intraspecific variation in dominant prairie grasses and composition of subordinate species on aboveground macroinvertebrate communities.

CHAPTER 2

COLONIZATION AND RECOVERY OF INVERTEBRATE ECOSYSTEM ENGINEEERS DURING PRAIRIE RESTORATION

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Introduction

Soil invertebrates contribute to decomposition, nutrient cycling, water infiltration, decomposition, nutrient cycling, primary productivity, plant community structure, and greenhouse gas emissions from soil (Holldobler & Wilson 1990; Edwards & Bohlen 1996; Dauber et al. 2008; Eisenhauer et al. 2009; Asshoff et al. 2010). The relationship between soil ecosystem engineers and ecosystem function underscores the need to understand how these organisms respond to ecological restoration and potentially use this belowground ecological knowledge to guide and/or enhance functions of restored systems (Jones et al. 1994; Heneghan et al. 2008; Baer et al. 2012).

Conventional agriculture negatively impacts soil invertebrate populations, particularly earthworms and ants (Andersen 1995; Postma-Blaauw et al. 2012). Earthworms enhance soil organic matter (Bossuyt et al. 2004), increase soil porosity, and accelerate nitrogen cycling largely through their burrowing and feeding activities (Lavelle 1988; Parkin & Berry 1999; Drake & Horn 2007). Globally, many native earthworm populations have become invaded and dominated by Eurasian species (Reynolds 1995). Given the ubiquitous distribution of Eurasian earthworms, the colonization of these soil engineers in restored environments will likely depend

on their dispersal capabilities and initial soil physical–chemical condition of the site (Eriksen-Hamel et al. 2009; Eijsackers 2011).

The reduction in ant populations in response to soil disturbance, such as cultivation, has consequences for several ecosystem functions and for plant communities (Philpott & Armbrecht 2006; Bisseleua et al. 2009; Fayle et al. 2011). Ant mound texture (mandible-sized aggregates) and architecture reduce bulk density, affecting water infiltration and soil moisture (Beattie & Culver 1977; Dostal et al. 2005; Jouquet et al. 2006). Ant mounds have been described as "islands of fertility" due to their enhanced nutrient status (e.g. nitrogen, phosphorus, and potassium) from the accumulation of stored food, feces, and aphid honeydew (Lavelle et al. 1997; Dostal et al. 2005; Lane & BassiriRad 2005). However, Dostal et al. (2005) documented decreased levels of nutrients where deep soil was incorporated into ant nests, a finding likely mediated by chemical properties of the soil profile (Frouz et al. 2003). Ant mounds can also influence plant growth by affecting rooting structure and mycorrhizal colonization thereby increasing plant community heterogeneity on the landscape (Beattie & Culver 1977; Dauber et al. 2008).

Conversion of grassland to agriculture is a global phenomenon (Ellis & Ramankutty 2008) that extends to the tall-grass prairie ecosystem (Samson & Knopf 1996). A common approach to restoring tallgrass prairie entails seeding native plant species (Packard & Mutel 1997). Plant cover and productivity can become representative of prairie that has never been cultivated within a few years (Baer et al. 2002, 2003), but recovery of below-ground structure and function generally requires decades (Baer et al. 2002, 2010; McLauchlan et al. 2006; Matamala et al., 2008). Less is known about the response of belowground invertebrates to grassland restoration, where unlike plants, colonization is a passive process (Majer & Nichols

1998; Majer et al. 2007a; Eijsackers 2011).

I used a 21-year chronosequence of restorations to address three objectives regarding the role of time, plant community structure, and soil properties on the recovery of the abundance and biomass of ants and earthworms. First, I aimed to quantify recovery rates of ants and earthworms and assess whether the composition of each group became representative of native prairie. Second, I aimed to elucidate whether plant richness was an important predictor of ant recovery during restoration. Our third objective was to evaluate whether recovery of soil invertebrates was related to ecosystem properties and processes. I hypothesized that recovery of ants and earthworms would be positively correlated with soil organic matter, aboveground productivity, litter, and root biomass.

Methods

Site Description and Study Design

I quantified ant and earthworm abundance and biomass in cultivated, restored, and native prairie soil at Nachusa Grasslands, a 1,100 ha nature preserve owned by The Nature Conservancy in northern Illinois, U.S.A. (41° 53′ 27.36″ N, 89° 20′ 36.56″ W). The preserve (appendix A) contains a matrix of more than 80 contiguous restorations (>1,000 ha) surrounding numerous small remnant prairies (<80 ha). Over the past 30 years, this region has received 975 mm of precipitation annually, of which 547mm occurs during the growing season (April 1–September 30). Annual precipitation during the study was higher than long-term trends, totaling 1,230 mm in 2008 (547 mm during the growing season), and 1,488 mm in 2009 (841 mm during the growing season).

Temperatures over a 30 year period averaged 9.1 °C (NOAA 2012). Annual temperatures were similar to long-term trends, averaging 8.6 °C (17.5 °C during the growing season) and 8.7 °C (17.0 °C) in 2008 and 2009, respectively. The study sites were characterized by sandy loam soil (Argiudoll, Haplodoll, and Hapludalf great groups) (Table 2.1).

I used a chronosequence approach to quantify change in abundance and biomass of ants and earthworms during grassland restoration following previous cultivation. The chronosequence contained two continuously cultivated fields (restoration age = 0) and 18 grasslands restored for 1–21years (Table 2.1), with replication of some restored grassland age classes. Two remnant prairies were also sampled to provide a benchmark against which to assess ant and earthworm recolonization (Table 2.1). Prior to restoration, each restored area had been conventionally tilled for production of *Zea mays* L. and *Glycine max* (L.) Merr. Each site was independently restored by ceasing cultivation and broadcasting locally collected seeds of up to 200 native plant species, with a similar suite of C4 prairie grasses and forbs. Fields were over-seeded the year following restoration, and occasionally in the third year of restoration (B. Kleimann 2008, Nachusa Project Director, personal communication). Managers and volunteer stewards work continuously to control non-native plants. Additional management activities included the use of a nearly annual prescribed fire regime. Fifteen of the 21 restorations and remnants were burned in the year of this study. The five unburned had been burned within 12 months and these restorations were replicate fields within a restored age class.

Ant and Earthworm Sampling Procedures

I used previously established transects for characterizing vegetation and soil properties in each

fiused previously established transects for characterizing vegetation and soil properties in each torations and remnants were burned in the year of this study. The five unburned had been burned within 12 months and these restorations were replicate fieldsestigation (Klopf 2013). Ants and earthworms were sampled by removing five monoliths (25 cm × 25 cm × 25 cm) at 5 m intervals along the central transect in each field. Because the sampling procedure was destructive, extraction of soil monoliths occurred in opposing cardinal directions 2 m away from plots where plant species composition was measured. Each field was sampled once in the spring and fall, but not all fields were sampled the same spring and fall. Sampling occurred October 28–30 in 2008, June 5–7 in 2009, and October 14–16 in 2009.

Laboratory Procedures

Ants and earthworms were hand-picked from the soil and preserved in approximately 8% formaldehyde. Ants were enumerated and identified (appendix B) to genus and species when possible using a combination of taxonomic keys provided by (Fisher & Cover 2007) and the Mississippi Entomological Museum (http://missi ssippientomologicalmuseum.org.msstate.edu//Researchtaxa pages/Formicidaehome.html). Ant identifications were verified by J. Trager (Missouri Botanical Garden). Earthworms were enumerated (appendix C) and identified to species using the taxonomic key provided in Dindal (1990). Following identification, each earthworm was gently extended, and measured to the nearest mm under a microscope. Preservation in formaldehyde caused the worms to contract, so extreme care was taken to extend each earthworm without stretching the specimen beyond a resting state length.

I quantified biomass of ants and earthworms based on ash-free dry mass (AFDM) to

eliminate inorganic particles that may have been present in gut contents (Benke et al. 1999). *Myrmica americana* and *M. spatulata* were similar in size, but not frequently collected, so they were combined for AFDM analysis. For the same reason, I combined the rarely collected genera of *Formica, Prenolepis, and Stenamma* for AFDM determination. For ants, multiple individuals of each species were dried at 55°C for 48 hours then weighed to 0.1 mg to determine dry mass (DM). Samples were then ashed at 500°C for 2 hours and reweighed to obtain the ash weight and AFDM was calculated by subtracting the ash weight from the DM (Appendix E). AFDM was determined from the average ADFM/individual of each species multiplied by the abundance of ants in each taxonomic level that could be identified (Table 2.2).

For earthworms, the same AFDM procedure was used for multiple individuals representative of a range of lengths. Earthworm lengths and AFDM were *ln*-transformed and length-to-mass relationships were determined using linear regression. Regression equations (Appendix D) were calculated for the *Aporrectodea* genus, the *Lumbricus* genus, juvenile earthworms, and earthworm fragments, as Hale et al. (2004) determined most Lumbricidae earthworms did not have significantly different allometric equations. Due to an inadequate number of *Bimastos longicinctus* and *Octolasion tyrtaeum*, neither species nor genera-specific length-to-mass regressions were possible to calculate, so the allometric equation for *Aporrectodea* was applied to estimate their mass. AFDM was determined for each earthworm genus and summed for each monolith to calculate total AFDM (Hale et al. 2004).

Explanatory Plant Community and Ecosystem Variables

In spring and fall of 2008, the percent cover of all plant species was visually estimated within 1

m^2 quadrats spaced at 5 m intervals along a transect in each field. Each transect contained a minimum of 10 quadrats, but additional quadrats were added until species richness saturated. Plant richness was calculated as the total number of species from the quadrats in each field. Shannon's diversity (H') of the plant community was calculated for each 1 m^2 sampling area along each transect in each field using the maximum cover of each species from the spring and fall vegetation surveys, and then averaged over the replicate sampling areas along each transect.

Multiple ecosystem properties were used in an attempt to explain dynamics of belowground ecosystem engineers in the restorations, but describing the change in ecosystem variables across the chronosequence was not the focus of this investigation. ANPP, litter, root biomass, and total soil C and N were quantified using the same methods as Baer et al. (2010). ANPP was quantified by clipping all vegetation within five 0.1 m^2 plots along each transect, the same number of samples taken by Baer et al. (2002) to quantify ANPP across a chronosequence of grassland restorations. Live vegetation was separated from surface litter. All biomass samples were dried at 55 °C for 1 week and weighed. Root biomass was quantified at each field from eight soil cores (5.5 cm diameter × 10 cm deep) taken in October 2009. In the laboratory, roots were hand-picked from each core, washed with deionized water, dried at 55 °C for 1 week, and weighed for biomass. Percent soil carbon and nitrogen were determined from 20 soil cores (2 cm diameter × 10 cm deep) that were removed, composited by site, and stored at 4 °C. In the laboratory, the composite soil samples were homogenized through a 4 mm sieve. Two 50 g sub-samples of soil from each site were dried at 55 °C, ground to a fine powder, and a subsample was dry combusted to determine percent C and N with a Thermo Flash 1112 CN Analyzer (distributed by CE Elantech Corp., Lakewood, NJ, U.S.A.).

Data Analyses

Ant and earthworm abundances were averaged over the spring and fall sampling events for each distance along the transect where monoliths were removed to determine a field average (n = 5 per field). Linear and nonlinear relationships between prairie age and the abundance and biomass of ants and earthworms were evaluated using Table Curve ® 2D 5.01 (Systat Software Inc 2002). I selected models that best explained patterns in abundance and biomass of ants and earthworms across the chronosequence based on coefficients of determination and model significance. Proportional similarity (PS) was calculated to examine whether changes in the ant and earthworm communities became more representative of native prairie over the restoration chronosequence (Brower et al 1990). Similarity was compared to native prairies using the average abundance of each species or genus in the two prairie remnants. Finally, I used Pearson's correlation procedure (SAS Inst. 2008) to examine the relationships between ecosystem properties (i.e. plant richness, diversity, ANPP, surface litter, root biomass, and %C and %N in soil) and the abundance and biomass of both invertebrate groups. Significance was assigned at $\alpha = 0.05$.

Results

Ant abundance and biomass

A total of 20,733 ants, representing 13 species, were recovered from the native and restored prairies. Ants were nearly absent in the cultivated fields (2.15 ± 1.44 ants/m^2). Native prairie

remnants contained 784 ± 416 ants/m^2. Restored prairies (averaged across all ages) contained 1,830 ± 786 ants/m^2, which was several orders of magnitude more ants than cultivated fields, and 2.3 times the ant abundance in the target system states (i.e. native prairie). Ant biomass followed a similar pattern among the cultivated (0.005 ± 0.003g/m^2), restored (0.376 ± 0.163 g/m^2), and native prairie sites (0.294 ± 0.192 g/m^2). *Lasius neoniger* (Emery) was the most common ant in all restorations and accounted for more than 80% of ant abundance and biomass (Appendix B). Ant abundance was best described by a peak Gaussian 4-parameter model (Fig. 2.1a), and biomass by a peak log-normal 4-parameter model (Fig. 2.1b). The nonlinear relationships resulted from a peak in ant abundance and biomass 5–8years following restoration (p = 0.036, r^2= 0.40, and p = 0.047, r^2 = 0.38, respectively). Following two decades of prairie restoration, abundance and biomass of ants were representative of native prairie, but community structure was only 32.5 ± 0.02% similar to native prairie and there was no directional change in PS toward native prairie across the chronosequence.

Ant abundance and biomass was more strongly related to the plant community than soil properties. Plant diversity and plant richness were significantly correlated with ant abundance ($H^{/}$: r = 0.51, p = 0.036; richness: r = 0.59 p = 0.013, respectively), and biomass ($H^{/}$: r = 0.52, p = 0.033; richness: r = 0.52, p = 0.003, respectively) (Fig. 2). Neither ant abundance nor biomass were correlated with percent soil C and N, root biomass, ANPP, or surface litter (p > 0.05).

Earthworm abundance and biomass

A total of 1,557 earthworms (including fragments), representing six species were recovered from the restoration chronosequence. The majority (64%) of earthworms were juveniles. *Aporrectodea*

tuberculata (Eisen), an exotic earthworm species, comprised approximately 90% of the identifiable adult earthworms (Table 2.3). Three individuals of *Bimastos longicinctus* were the only native earthworms represented in this study.

Earthworm abundance increased linearly across the restoration chronosequence (r^2 = 0.39, p = 0.004) at a rate of approximately 3 individuals m^{-2} y^{-1}. (Fig. 2.3a). The cultivated fields supported an average of 56 ± 15 earthworms/m^2. Fields restored for 21 years supported up to 142 earthworms/m^2. Earthworm biomass did not change directionally across the chronosequence (Fig. 2.3b). The similarity of earthworm species composition to native prairie did not change across the chronosequence and the restored earthworm communities were highly similar (89.7 ± 0.02%) to native prairie.

Earthworm abundance was not related to any plant or soil attributes (p > 0.05). Only surface litter (r = 0.57, p = 0.010) was positively correlated to earthworm biomass.

Discussion

Soil ecosystem engineers are sensitive to land degradation (Edwards & Bohlen 1996). This is the first study to document that ants and earthworms respond to grassland restoration in North America. Exotic earthworms and a generalist ant species dominated the restored and native prairies. Recovery of ants was correlated with aspects of the plant community. Cessation of cultivation was the only discernable factor influencing earthworm abundance, with increasing time since cultivation (corresponding to restoration) resulting in higher earthworm abundance. Earthworm biomass, however, was positively related to surface litter.

Due to their ubiquitous worldwide distribution, sensitivity to perturbation, and status as

ecosystem engineers, ants have been used as indicators of environmental degradation and restoration (Majer et al. 2007b; Fagan et al. 2010; Pecarevic et al. 2010). Restorations aimed to increase plant diversity have been shown to promote ant colonization and harbor ant richness representative of reference site levels in former open cast mines (Majer & Nichols 1998). Our results also demonstrate that ant density and biomass were correlated with plant richness and diversity. It is unlikely that ant species could be used as indicators of plant diversity in this landscape restoration because the dominant ant (*Lasius neoniger*) was a generalist species commonly found in corn fields, grasslands, and urban environments (Wilson 1955; Pecarevic et al. 2010).

The most frequently encountered earthworm in this study (*Aporrectodea* tuberculata) was a species native to Europe, now common in North America. This endogeic (mineral soil inhabiting) earthworm has well-known impacts on nutrient cycling (Bohlen & Edwards 1995), but may function differently than native earthworms due to temporal differences in activity relative to native earthworms (James 1991). For example, exotic earthworms tend to aestivate during the hot dry months, while native earthworms remain active (Callaham et al. 2001). Callaham et al. (2001) also found evidence of increased plant-microbe competition for nitrogen in the presence of native earthworms relative to exotic earthworms. To date, no studies have compared the functional role of native and non-native earthworms in restored grasslands.

The positive relationship observed between surface litter and earthworm biomass was driven by five unburned sites that contained a litter layer. All the burned sites contained negligible amounts of litter, whereas litter accumulation in the unburned sites ranged from just over 20 to nearly 80 g/m^2. The presence of surface litter lowers soil temperature and increases soil moisture relative to the absence of surface litter, conditions that are more conducive for

development of earthworm populations (Wever et al. 2001). Thus, management of restored grasslands could have consequences for earthworm populations and their functional role in these systems, particularly in long-term unburned situations (Callaham et al. 2003).

Cultivation substantially reduces earthworm populations through direct mortality and in response to lower organic matter (Edwards & Bohlen 1996; Chan 2001). Earthworms have been shown to increase and influence soil properties in European post mining systems undergoing natural succession (Frouz et al. 2008; Roubí˘ckov´a et al. 2009). The average abundance of earthworms observed in the restored grasslands was lower than the density reported by Eriksen-Hamel et al. (2009) from no-till fields (422 earthworms/m^2), but within the range of variability from conventional lands (138–913 earthworms/m^2) reported by Chan (2001). Earthworm community structure can shift from functional groups of deep permanent burrow creating species to shallower, horizontal burrowing species in response to tillage (Hubbard et al. 1999; Chan 2001). A shallow dwelling species, *A. tuberculata* dominated most restorations in this study.

This is the first study to document patterns in the abundance and biomass of invertebrate ecosystem engineers in response to tallgrass prairie restoration and elucidates different drivers in recovery of ants and earthworms (i.e. plant community diversity vs. time and associated ecosystem recovery, respectively). The ubiquity and increasing abundance of exotic earthworms, which are functionally different than native earthworms, during tallgrass prairie restoration represents potentially novel conditions for prairie development that could influence plant community and ecosystem recovery (Hobbs 2005; Seastedt et al. 2008; Hobbs et al. 2009). Knowledge of the consequences of these no-analogue conditions on the structure and function of restorations is needed to understand the ecosystem services enhanced or compromised by exotic belowground engineers (Baer et al. 2012).

Implications for Practice

- Restoring conventionally cultivated land to grassland increases the abundance of ants and earthworms, which provision food for many wildlife species.
- Earthworm abundance increases linearly during prairie restoration to represent remnant prairie within two decades, but earthworm taxa in restored and remnant prairies are most likely to be exotic in agricultural landscape of the U.S. Upper Midwest. Despite their origin, these ecosystem engineers are soil bioturbators, which likely has implications for soil properties and processes. This study indicates earthworm abundance and biomass are unrelated to plant community structure.
- Ant abundance and biomass were positively correlated with plant diversity. Thus, diverse restorations with a corresponding high abundance of ants likely contain heterogeneous soil and plant communities.

Table 2.1 Study site names, years restored, soil classification, field size, and locations at Nachusa Grasslands

Site Name	***Years Restored***	***Soil Series***	***Soil Class***	***Size (ha)***	***GPS Coordinates***
Cultivated	0	Waukee Loam	Mesic typic hapludoll	12	41.90218/-89.34175
Cultivated	0	Jasper Loam	Mesic typic Arguidoll	0.96	41.90791/-89.34042
TNC 74	1	Jasper Loam	Mesic typic Argiudoll	4.6	41.86559/-89.35738
TNC 69	1	Waukee Loam	Mesic typic Hapludoll	2.7	41.89085/-89.35358
TNC 68	1	Waukee Loam	Mesic typic Hapludoll	3.2	41.90937/-89.33424
TNC 66	1	Rodman-Warsaw complex	Mesic typic Argiudolls	8.05	41.90301/-89.32982
TNC 58	5	Martinsville silt loam	Mesic typic Hapludalf	3.2	41.87027/-89.36000
TNC 57	5	Jasper Loam	Mesic typic Argiudoll	2.7	41.88330/-89.32540
TNC 56	5	Jasper Loam	Mesic typic Argiudoll	7.4	41.89986/-8932475
TNC 55	5	Waukee Loam	Mesic typic Hapludoll	1.01	41.8909/-89.34277
TNC 53	8	Martinsville silt loam	Mesic typic Hapludalf	1.6	41.86968/-89.35984
TNC 52	8	Waukee Loam	Mesic typic Hapludoll	3.1	41.89854/-89.36454
TNC 25	9	Waukee Loam	Mesic typic Hapludoll	0.89	41.89813/-89.36278
TNC 15	13	Jasper loam	Mesic typic Argiudoll	14.5	41.87589/-89.35399
TNC 37	16	Jasper Loam	Mesic typic	11.7	41.86971/-89.36009

Table 2.1 (continued)

TNC 31	16	Jasper Loam	Argiudoll Mesic typic Argiudoll	1.7	41.88354/-89.34217
TNC 13	21	Warsaw Loam	Mesic typic Argiudoll	3.6	41.87816/-89.35468
TNC 12	20	Warsaw Loam	Mesic typic Argiudoll	3.1	41.879275/-89.35576
TNC 9	16	La Hogue Loam	Mesic Aquic Argiudoll	5.8	41.882918/-89.34996
TNC 7	21	Jasper Loam	Mesic typic Argiudoll	8.09	41.88436/-89.34539
Isabell's	Prairie	Jasper Loam	Mesic typic Argiudoll	6.07	41.87894/-89.34260
Thelma-Carpenter	Prairie	Elizabeth Loam	Mesic Lithic Hapludolls	4.04	41.88474/-89.32274

Table 2.2 Average relative abundance of ant larvae and adults in each restored prairie age class and remnant prairie.

	0	1	5	8	9	13	16	20	21	Remnant
Age	n = 2	n = 4	n = 4	n = 2	n = 1	n = 1	n = 3	n = 1	n = 2	n = 2
Ant Larvae	0.00	0.06	0.04	0.06	0.10	0.31	0.03	0.05	0.04	0.05
Aphaenogaster rudis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Brachymyrmex depilis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Crematogaster spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Formica spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
Lasius claviger	0.00	0.00	0.00	0.01	0.05	0.06	0.03	0.00	0.20	0.00
Lasius neoniger	0.41	0.91	0.92	0.87	0.68	0.27	0.92	0.90	0.33	0.24
Myrmica spp.	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.07	0.16
Paratrechina parvula	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.03	0.23
Ponera pennsylvanica	0.59	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.03
Prenolepis imparis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solenopsis molesta	0.00	0.01	0.03	0.05	0.08	0.32	0.00	0.05	0.00	0.22
Stenamma spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Temnothorax ambiguus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00

Note: It should be noted *Crematogaster* spp. and *Prenolepis* spp. were present, but extremely rare, and when calculating relative abundance, the values for these species fell below 0.00. Relative abundance was calculated as the number of individuals of a species in an age class as a percent of total abundance in that age class.

Table 2.3. Average relative abundance of earthworm cocoons, juveniles, fragments, and adults of each species in each restored prairie age and remnant.

	0	*1*	*5*	*8*	*9*	*13*	*16*	*20*	*21*	*Remnant*
Age	*n = 2*	*n = 4*	*n = 4*	*n = 2*	*n =1*	*n = 1*	*n = 3*	*n = 1*	*n = 2*	*n = 2*
Cocoons	0.18	0.14	0.05	0.10	0.05	0.25	0.02	0.01	0.04	0.04
Juveniles	0.57	0.55	0.65	0.47	0.70	0.50	0.67	0.65	0.68	0.66
Fragments	0.08	0.11	0.18	0.20	0.13	0.08	0.17	0.22	0.18	0.19
Aporrectodea trapezoides	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Aporrectodea tuberculata	0.15	0.20	0.12	0.21	0.13	0.17	0.14	0.12	0.10	0.10
Bimastos longicinctus	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lumbricus spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Octolasion tyrtaeum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00

Note: Relative abundance was calculated as the number of individuals of a species in an age class as a percent of total abundance in that age class.

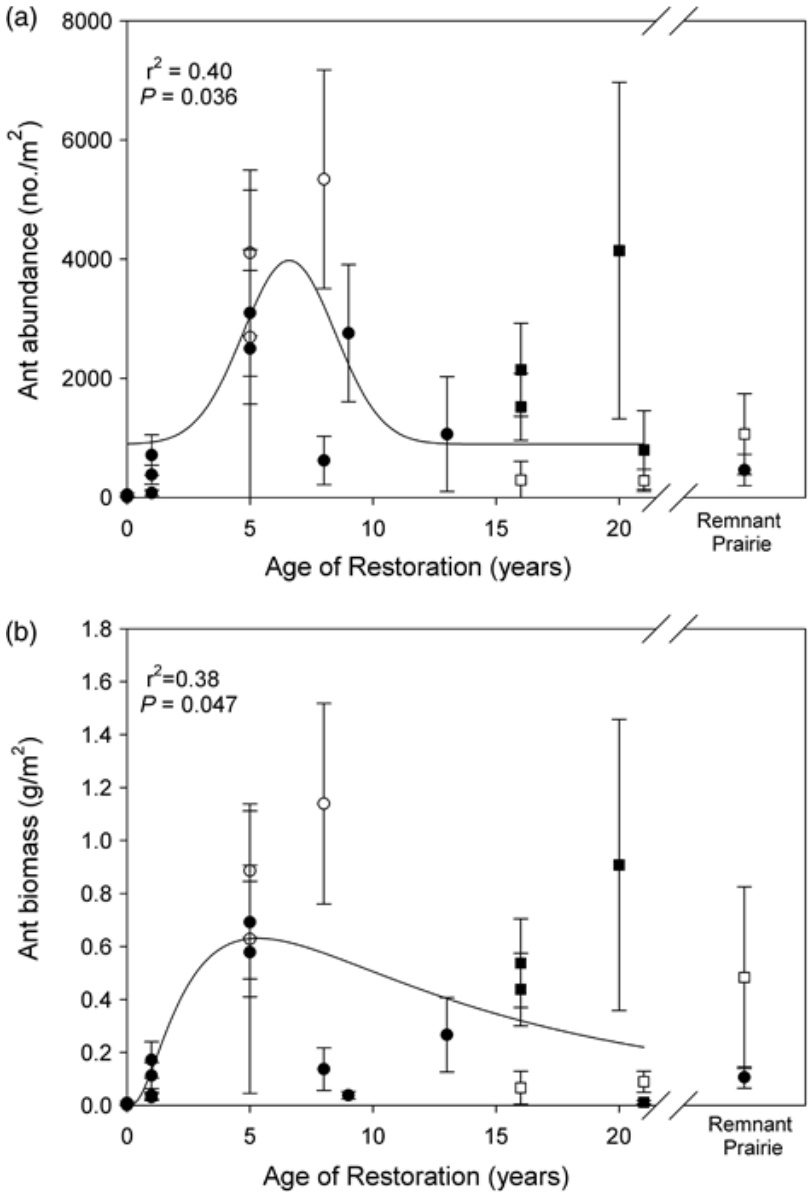

Figure 2.1 Mean (± SE) abundance and biomass of ants across the restoration chronosequence and native prairie. Standard errors indicate within-field variability. A nonlinear model best described the relationship between (a) ant abundance and restoration age, whereas, a peak log-normal model best described the relationship between (b) ant biomass and restoration age. Native prairie sites were not included in the analyses. Filled symbols represent sites burned prior to sampling; unfilled symbols represent fields that were not burned in the year of the study but within 18 months of study. Circles represent fields sampled in October 2008 and June 2009; squares represent fields sampled in June and October 2009.

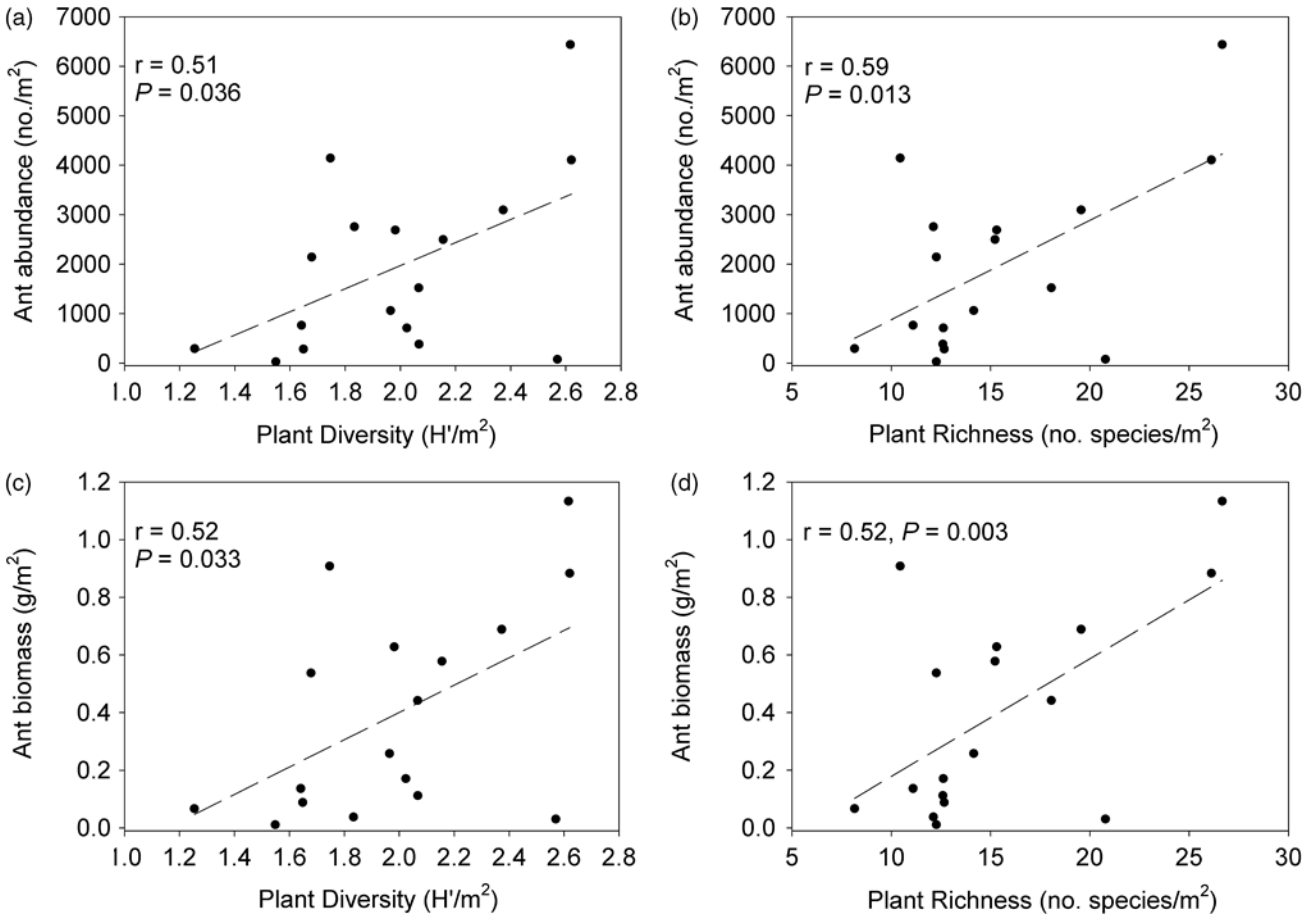

Figure 2.2 Correlations between ant (a) abundance and plant diversity, (b) abundance and plant richness, (c) biomass and plant diversity, and (d) biomass and richness in the restored prairies. Cultivated sites and native prairie sites were not included in the figure or analysis.

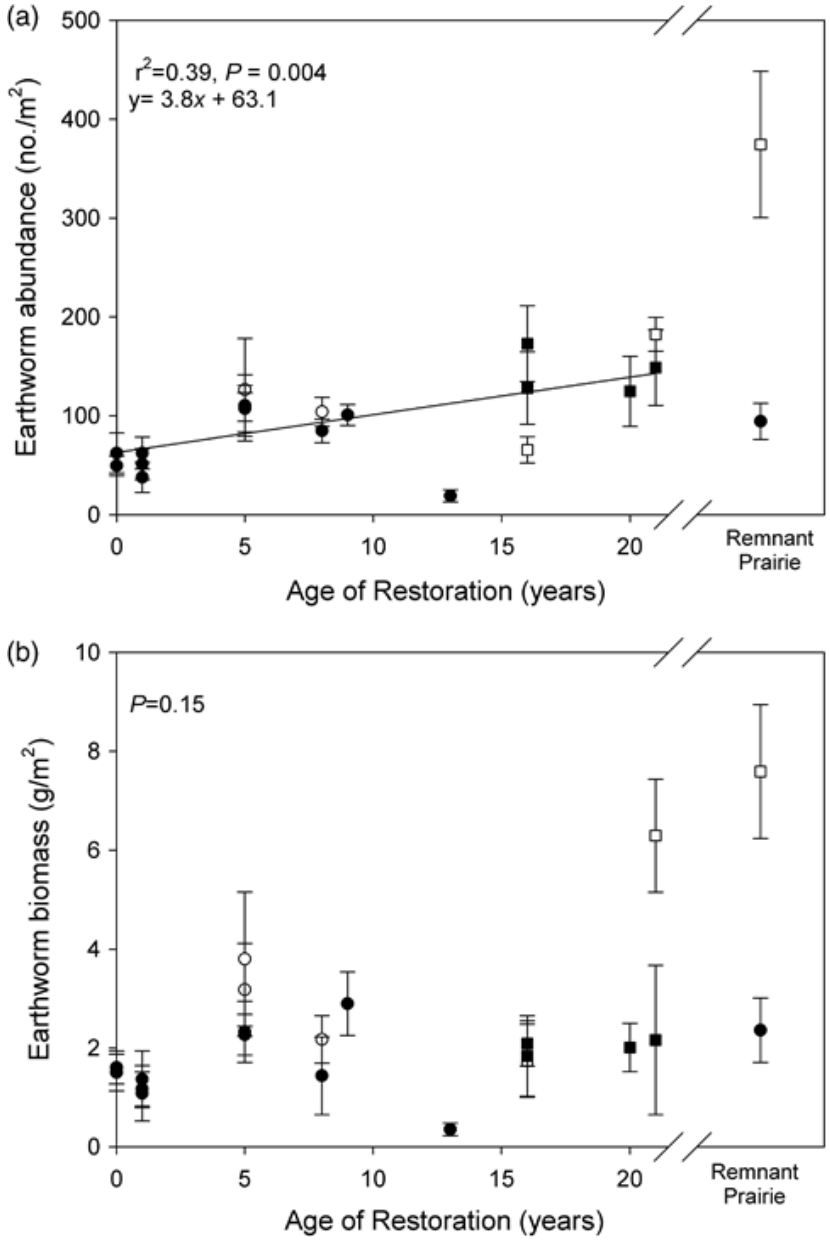

Figure 2.3 Mean (± SE) (a) abundance and (b) biomass of earthworms across the restoration chronosequence and native prairie. Standard errors bars indicate the within-field variability. Linear regression best described the relationship between earthworm abundance and age of restoration. Native prairie sites were not included in the analyses. Filled symbols represent sites burned prior to sampling; unfilled symbols represent fields that were not burned in the year of the study but within 18 months of study.

CHAPTER 3

IF YOU BUILD IT WILL THEY COLONIZE? A TEST OF THE FIELD OF DREAMS PARADIGM WITH SOIL INVERTEBRATE COMMUNITIES

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Introduction

Soil invertebrates contribute to decomposition, nutrient cycling, water infiltration, trophic transfer of energy and material in ecosystems (Lavelle et al., 1997; Riggins et al., 2009), and can influence the successional trajectory of vegetation (Brown and Gange, 1989, 1992; De Deyn et al., 2003; Schadler et al., 2004). Despite their critical role in terrestrial ecosystem functioning and composition (Lavelle et al., 1997), soil invertebrates are frequently overlooked in ecological restorations (Snyder and Hendrix, 2008). Knowledge of how their communities change in response to restoration is needed for a more holistic assessment of ecosystem recovery from disturbance.

The extensive conversion of the grassland biome to row crop agriculture (Ellis and Ramankutty, 2008), including >90% of the tallgrass prairie in North America (Samson and Knopf, 1994), has negatively impacted soil invertebrates (Giller et al., 1997; Postma- Blaauw et al., 2012). Ecological restoration is the only means to increase the extent and quality of grassland, and this practice often involves reintroduction (sowing) of historic plant species (Hobbs and Harris, 2001). Invertebrate propagules, however, are rarely introduced into restorations (Lawrence et al., 2013). Thus, colonization of soil biota is generally dependent on natural dispersal from the regional species pool from the surrounding landscape, which is highly

fragmented and agricultural. Hilder- brand et al. (2005) refer to this mechanism of community assembly as the “field of dreams myth,” in reference to the 1989 American film starring Kevin Costner. Hilderbrand et al. (2005) suggest physical template and process driven restoration are important, but self assembly of pre-disturbance communities may not occur.

Soil invertebrate communities are influenced by the quantity and quality of organic matter input from the plant community (Scheu and Schaefer, 1998; Callaham et al., 2003; Evans et al.,2005a) and interactions with higher trophic levels (Siemann,1998). The density and biomass of soil invertebrates varies with fire frequency, mowing, and nutrients in tallgrass prairie (Callaham et al., 2003). Burning and mowing reduced the quantity and quality (higher C:N ratio) of root inputs, corresponding with a reduction in invertebrate density, whereas nutrient addition tended to increase invertebrate density or biomass. Berg and Hemerik (2004) that soil macroinvertebrates (isopods, millipedes, and centipedes) in four European grasslands recovering from long term fertilization responded to changes in soil nutrient status that were driven by successional changes in the plant community. Recovery of specific groups may occur in the absence of whole community recovery. For example, Brand and Dunn (1998) found restoration time to be important for recovery of Collembola species richness.

A clear understanding of belowground macroinvertebrate community recovery from disturbance and in response to restoration is lacking for most systems. I quantified soil acroinvertebrates across a chronosequence of restored tallgrass prairies to better understand the rate and compositional change in response to time since cessation of cultivation coinciding with restoration. I hypothesized that taxonomic richness, evenness and diversity of macroinvertebrates would increase across the chronosequence in response to developing root systems and soil organic matter inputs (Matamala et al., 2008; Baer et al., 2010). Additionally, I hypothesized that

different trophic groups would respond to the chronosequence idiosyncratically because detritivores and herbivores are likely more dependent on developing root systems than omnivores and predators. I predicted omnivores would be more responsive to plant richness because previous study has shown the dominant taxa in this group, ants, were correlated with plant richness (Wodika et al., 2014). Predator density was not expected to change across the chronosequenec since prey resources can be abundant early in restorations. Finally, because recovery of roots and perennial plant cover can occur within two decades of grassland restoration (Baer et al., 2002, 2010), but plant diversity can fail to represent that of remnant prairie (Sluis, 2002; Hansen and Gibson, 2014), I predicted that macroinvertebrate community structure would become similar to but not representative of remnant prairie following two decades of restoration.

Materials and Methods

Site description and study design

Soil invertebrates were sampled at Nachusa Grasslands, owned by The Nature Conservancy and located in Ogle and Lee (41 530 27.3600 N, 89 200 36.5600 W) counties of northern Illinois. Nachusa Grasslands contains >1100 ha of small prairie remnants and independently restored prairies embedded in a matrix of active agricultural fields. The soils of the study site are sandy loams formed by alluvial and Aeolian processes (Argiudoll, Haplodoll, and Hapludalf great groups). Temperatures during this study were comparable to long term averages at 8.6° C and 8.7° C in 2008 and 2009. Precipitation exceeded the thirty year average (975 mm) in the years of this study, totaling 1230 mm in 2008, and 1488 in 2009 (NOAA, 2013).

I used a chronosequence (space for time substitution) approach to quantify changes in the soil invertebrate community across prairies restored for different periods of time. Our study design contained two active agriculture fields (age = 0), 18 restorations (restored for 1–21 years), and two remnant prairies that have never been plowed (Table 1). I used remnant prairies to assess the trajectory of change and compare the recovery of macroinvertebrate community structure in the restorations.

Restoration followed cessation of conventional tillage agriculture for corn (Zea mays L.) and soybean (Glycine max (L.) merrn) production. Each field was independently restored by broadcasting a locally collected seed mixture containing up to 200 species of native forbs and graminoids. Restorations were often over-seeded before the second growing season and occasionally in the third year (Bill Kleiman, personal communication). Non-native plants were controlled through mechanical removal and spot-spraying with herbicides. All sites were burned regularly. Prescribed fire is applied to the preserve in the spring and in fall such that study sites experienced a fire return interval of approximately every 18 months (Bill Kleiman and Cody Considine, personal communication).

Prior to purchase by The Nature Conservancy, the remnant prairies in this study were degraded by overgrazing cattle and encroachment by woody vegetation. Management has consisted of cattle removal, tree/shrub removal, and a frequent fire regime. Plant surveys of these prairies in 2008 demonstrated that Remnant1 had a plant community of greater diversity than Remnant 2 (Klopf, 2013).

Soil invertebrate sampling and processing procedures

Soil macroinvertebrates (0.5 mm in length) were sampled from soil monoliths extracted along a transect established to measure plant community. Each field was sampled twice to capture seasonal variation in the belowground macroinvertebrate communities: once in the spring and once in the fall. Most fields were sampled in October 2008 and June 2009. I was able to add more fields to the chronosequence in the spring, so these fields were sampled in June 2009 and October 2009. On each sampling occasion, five monoliths (25 cm length 25 cm width 25 cm deep) were removed from each field at 5 m intervals along a transect. Soil monoliths were sampled 2 m away from the vegetation transect in a cardinal direction.

Soil monoliths were broken apart by hand and visually searched for macroinvertebrates in the lab. Specimens were preserved in 8% formaldehyde. To assess recovery of the entire community, I assigned individuals to morphospecies. The morphospecies method is useful when examining an entire invertebrate assemblage (Oliver and Beattie, 1996; Litt and Steidl, 2010), and especially useful in this study as the soil environment contains numerous immature invertebrates that lack genus and species keys (Appendix F). Dindal (1990) was used to identify many of the soil invertebrates encountered (Oligochaeta, Diplopoda, Chilopoda, Isopoda, Opiliones). Adult insects were sorted and identified to order and then family based on characteristics in Triplehorn et al. (2005). Ants (Hymenoptera: Formicidae) were identified to genus or species using a combination of sources including Fisher and Cover (2007), and online keys(http://mississippientomol(ogicalmuseum.org.msstate.edu/Researchtaxapage/Formicidaehome.html). Ant identifications were verified by James Trager (Missouri Botanical Garden). Lindroth (1961–1969) Lindroth (1961–1969) was used to identify ground beetles (Coleoptera:

Carabidae) to genus. Cushing and Ubick (2009) was used to identify spiders (Aranea) to family. Immature insects were identified to family using Peterson (1948,1962),) and Stehr (1987, 1998),).

Vegetation measurements

I used plant community and aboveground net primary productivity (ANPP) data collected by Klopf (2013) and analyzed by Wodika et al. (2014) to explain variation in the macroinvertebrate communities. The percent cover of each species was visually estimated from a minimum of 10 quadrats (1 m^2) established along a centrally located transect in each field in the spring and fall of2008. Additional quadrats were added until plant species richness peaked. Plant species richness (S) was calculated as the average number of species per transect from each field. Shannon's diversity (H′) was calculated for each quadrat using the maximum cover of each species from the spring and fall sampling. Aboveground vegetation was clipped and separated from the previous years' growth from five 0.1 m2 quadrats along each transect, dried at 60°C, and weighed to estimate ANPP.

Statistical analyses

Field-level densities for all for all macroinvertebrate taxa (morphospecies) were obtained by averaging the spring and fall samples for each sampled distance along each transect (n = 5). Macroinvertebrate taxonomic diversity indices [richness (S), Shannon's diversity (H′), and evenness (J′)] were calculated in Primer (Clarke and Gorley, 2006) for each soil monolith and

averaged for each field. To assess the response of higher taxonomic units (i.e., Orders) to restoration, morphospecies densities from individual orders were summed. Macroinvertebrates were assigned to trophic groups (Appendix G) based on literature (Peterson 1948, 1962,2; Triplehorn, 2005; Fisher and Cover, 2007; Cushing and Ubick, 2009). Changes in diversity indices, orders, and trophic groups across the chronosequence were analyzed using linear and nonlinear regression in Sigmaplot 11.0 (Systat Software Incorporated, 2008). The relationship between plant community H′ and S and specific macroinvertebrate groups was explored using Pearson's correlation procedure.

Non-metric multi-dimensional scaling (NMDS) coupled with vector fitting was used to examine plant community factors related to macroinvertebrate community structure using the field average abundance of each morphospecies. NMDS is an iterative technique that places sampling units into ordinal space based on dissimilarity; plots with greater dissimilarity are located further apart. The Bray–Curtis dissimilarity measure was chosen with 1000 random starting configurations in DECODA (Minchin, 1987). Ordination solutions were selected based on the stress value (a measure of the fit), number of dimensions, and interpretability (Mccune et al.,2002). Vector fitting (Kantvilas and Minchin, 1989) was used to examine the correlations between macroinvertebrate community structure and plant S, plant H′ , ANPP, and plant community age. An age value of 500 years was used as a proxy for the remnant prairie age. The NMDS ordination and vector fitting were performed with DECODA version 3.01 software (Kantvilas and Minchin, 1989).

I assessed whether the whole soil invertebrate community became increasingly similar to the remnant prairies across the restoration chronosequence using proportional similarity (PS) (Whittaker, 1975). This index was calculated from the density of each taxonomic unit in each

remnant, then averaged to provide a "composite" remnant to provide a reference community for each field in the restoration chronosequence. I analyzed whether PS changed across the chronosequence using linear regression. Lastly, I performed an indicator species analysis (ISA) to identify fidelity and constancy of taxa in each restoration age, remnant prairies, and cultivated fields using PC-ORD (Mccune et al., 2002; Mccune and Mefford, 2011). One thousand randomizations were used in the Monte Carlo tests to calculate the indicator value (Dufrêne and Legendre, 1997).

Results

A total of 23,554 invertebrates from 172 taxonomic units (morphospecies) were recovered across the restoration chronosequence, agricultural fields, and remnant prairies. Total taxonomic richness (S), diversity (H′), and evenness (J′) did not change across the chronosequence ($P > 0.05$; Fig. 3.1A–C). Cultivated fields contained few taxa, but showed high J′ and subsequently high H value relative to the restorations and remnants. There were no significant changes in higher taxonomic groupings, i.e., Hemiptera, Coleoptera (adults and larvae), Orthoptera, Diptera, Chilopoda, Diplopoda, or Isopoda ($P > 0.05$; data not presented).

Most (86%) macroinvertebrates were omnivorous. Approximately 8% were strictly detritivores, 4% were predators, and 1% were herbivores. Detritivore density increased with years since restoration at a rate of 7 individuals m^{-2} $year^{-1}$ (Fig. 3.2A). Omnivore density peaked 5–8 years following restoration, a response described by a peak Gaussian 4 parameter model (Fig. 3.2C). Predator and herbivore density did not change across the restoration chronosequence (Fig. 3.2B and D). Spider density increased at a rate of 0.25 individuals m^2 $year^{-1}$ ($r^2 = 0.19$, P =

0.05; Fig. 3.2E). Total macroinvertebrate richness and omnivore herbivore densities were positively correlated with plant richness (Fig. 3.4A and B).

A 2-dimensional NMDS ordination (Fig. 3.3) coupled with vector fitting showed that the plant community metrics were significantly correlated to macroinvertebrate community structure, but time and ANPP were not significant. Plant diversity ($R = 0.54$, $P = 0.008$) and richness ($R = 0.59$, $P = 0.018$) were significant vectors in the direction away from the ordination space cultivated fields occupied.

Proportional similarity of macroinvertebrate communities to remnant prairie increased linearly across the chronosequence, suggesting the invertebrate community of older restorations trended toward a community composition that was intermediate to the two remnant prairie communities (Fig. 3.4). There was also greater variability in the similarity values of young restorations relative to the older restorations and remnants

The indicator species analysis revealed a total of 29 taxa indicative of 6 different age classes. The remnant prairies contained the most indicator taxa (12 morphospecies), comprising 41% of taxa identified (Table 2). Notably, many of the remnant prairie indicator taxa were ants; a group that frequently forms mutualistic relationships with plants. The cultivated fields contained one earthworm and two Coleoptera indicator taxa. The 20 and 21-years old restorations contained no indicator taxa, whereas the 16-years old restorations contained a single indicator Staphylinidae (Coleoptera) morphospecies. The single 13-years old field contained 8 morphospecies. The 8 and 9-years old restorations did not have any unique taxa, but 5-years old restorations contained a cosmopolitan ant species (Lasius neoniger) and a long horned beetle as indicators. First year restorations had 3 ground beetle taxa associated with open and disturbed ground and larvae of Cantharidae (Coleoptera).

Discussion

Understanding soil macroinvertebrate recovery from long-term disturbance is likely to be a key component of restoration success as these organisms are crucial links for the transfer of energy and material between the belowground and aboveground systems (Kardol and Wardle, 2010). With a few notable exceptions (Berg and Hemerik, 2004; Ingimarsdóttir et al., 2012), soil invertebrate reassembly is rarely studied and the factors influencing their recovery are even less understood. This study documents the role of time since cessation of cultivation coinciding with perennial plant community development on soil macroinvertebrate recovery during tallgrass prairie restoration. Contrary to our expectations, I found macroinvertebrate taxonomic diversity, richness, and evenness did not increase across the restoration chronosequence. Taxonomic richness of restorations was intermediate to the continuously disturbed (agricultural fields) and undisturbed (remnant prairies) states and within the range of the two remnants, which had disparate levels of taxonomic richness. Orlofske et al. (2011) found that remnant prairie tended to have more insect families and greater abundances of aboveground invertebrate diversity at the family level, but not significantly so. Brand and Dunn (1998) found remnant prairies contain more Collembolan species than 17 and 24-years old restorations and remnants supported similar densities of this group and more Collembolans than younger restorations.

Macroinvertebrate detritivores increased across the restoration chronosequence, which indicates change in energy flow pathways during restoration. Earthworms were responsible for the increase in detritivores across the chronosequence (Wodika et al., 2014). Changes in omnivore density was a result of an increase in Lasius neoniger (Formicidae), a cosmopolitan ant

species that is responsive to elevated plant richness in the 5–8 year old restorations (Wodika et al., 2014). No change in predator and herbivore density across restoration chronosequence was surprising, but the densities of these taxa were within the ranges found between the remnant prairies. The composition of these groups, however, did change with restoration, as indicated by the proportional similarity and indicator species analyses.

Spider density increased across the chronosequence and became representative of remnant prairie in the 20 and 21 year old restorations. Spiders are important predators in grasslands and old fields with the potential to influence plant community and ecosystem properties via trophic cascades driven by altered herbivore identity and behavior in response to spider predation (Schmitz, 2006, 2008). Examination of aboveground and surface dwelling spiders in reclaimed Australian bauxite mines revealed that spider richness was similar within the forested tract irrespective of reclamation age (Simmonds et al., 1994). Microsite characteristics such as litter depth and vegetation density were stronger determinants of spider richness than age. The oldest bauxite mine reclamation site (18 years) supported a spider community that was distinct from the two forested sites, but most similar in composition relative to the younger reclamations. These findings suggest nearly two decades of restoration was not enough time to fully restore the spider community composition, and these reclamations may have altered invertebrate successional trajectories.

Aspects of the plant community are well-known drivers of invertebrate communities (Janzen, 1970). I found invertebrate taxonomic richness was correlated with plant diversity and richness. High numbers of plant species likely provide a variety of food resources and potentially more energy for herbivores and omnivores for the total population of these trophic groups (Evans

et al., 2005b). Thus, restorations with high plant diversity may enhance the abundance and diversity of the soil invertebrate community.

Community composition of soil macroinvertebrates changed across the restoration chronosequence. The macroinvertebrate community became more similar to the average of the remnant prairies across the chronosequence resulting from less variability among communities in fields of the same age across the chronosequence. This relationship, however, was not observed when PS was calculated for each remnant prairie (data not presented). Thus, the macroinvertebrate communities were developing a composition intermediate to the remnant prairies. The increase in PS across the chronosequence coincided with less variability in this index. High variability in PS of the young restorations relative to the composite reference suggests the assembling communities might be initially governed by stochastic processes (Chase, 2007), but some presumably similar ecological filters develop as restoration proceeds to reduce variation in community composition. Despite the increase in PS to the target state, the level of PS was low even in the oldest sites, suggesting two decades of restoration is not sufficient for full recovery of the macroinvertebrate community.

Reference communities are frequently used to evaluate the current state and recovery trajectory of an ecosystem (White and Walker, 1997). Selecting an appropriate reference is challenging as these sites may be rare and the historic condition may be an unrealistic target in a changing world (White and Walker, 1997; Hallett et al., 2013). In the agriculturally dominated landscape of the upper Midwestern US, i.e., Illinois, remnants prairies are extremely uncommon (Samson et al., 2004). The undisturbed prairies in this study were selected from a very small pool of potential analogs based on site size and soil type that was comparable to the restoration chronosequence. The highly variable invertebrate community structure found within our remnant

prairies complicates the interpretation of potential recovery in the chronosequence. With such a small sample of available remnant prairies, it is unknown which of the two remnants provide a better reference/target for the chronosequence, or whether either remnant represents a plausible target community. I chose to interpret our results using the two remnant prairies as "brackets" for a range of metrics to assess recovery to remnant conditions. Pollock et al. (2012) suggest there can be a great deal of variability in a target community and this should be considered in evaluation of recovery to reference conditions.

The composition of soil biota is generally not considered in the evaluation of restoration success (Heneghan et al, 2009), althought exotic earthworms and shrubs have been linked to invasion meltdown (Heneghan et al., 1006; Madritch and Lindroth, 2009). At Nachusa Grasslands, a remnant or restored prairie with an abundance of non-native plants would be considered degraded or failure, respectively (B. Kleiman, personal communication). Two exotic earthworms species were indicators of the remnant prairies in this study, complicating our interpretation of soil invertebrate recovery in restorations. There was a legacy of cattle grazing and woody plant invasion in the prairie remnants which have been managed intensively since becoming part of the preserve. These legacies may have contributed to spatial variation in the belowground macroinvertebrate communities and divergent changes in composition over time. No knowledge of temporal dynamics in the remnant prairie macroinvertebrate communities limits the ability to assess recovery to a reference condition. This underscores the need to better characterize the soil biota (spatially and temporally) in less degraded systems that are candidate references or targets for restoration; a topic lagging behind the plant-focused field of restoration ecology (Young, 2000; Heneghan et al., 2008).

Contrary to plant community restoration, macroinvertebrate recovery is reliant on natural colonization processes, which may select for species with good dispersal abilities, e.g., winged insects (Brown, Smith and Batzer 1997). Low rates of dispersal among invertebrate groups, a legacy of degraded soil, and a depauperate regional species pool resulting from centuries of row crop agriculture creates a situation that may severely limit recovery of many invertebrate groups, so as suggested by Hilderbrand et al, (2005), "if you build it" they (soil invertebrates) may not recolonize. This constraint to community assembly may result in alternate successional trajectories of community development and stable equilibrium that is different than the nearby remnant prairies (Chase,2003). If the goal of restoration is to restore the full function and processes to an ecosystem (Ruiz-Jaen and Mitchell Aide, 2005), reintroduction of soil invertebrates by assisting colonization of key taxa (e.g. ecosystem engineers) or whole communities may be needed to reinstate plant-soil feedbacks, foodwebs, and nutrient cycling (Kardol et al., 2005; Kardol and Wardle 2010).

Table 3.1: Chronosequence experimental design with field site name, number of years restored at the time of study, soil series, and soil class.

Site Name	Years Restored	Soil Texture	Soil Class
Cultivated	0	Loam	Mesic typic Hapludoll
Cultivated	0	Loam	Mesic typic Arguidoll
TNC 74	1	Loam	Mesic Typic Argiudoll
TNC 69	1	Loam	Mesic Typic Hapludoll
TNC 68	1	Loam	Mesic Typic Hapludoll
TNC 66	1	Loam	Mesic Typic Argiudolls
TNC 58	5	Silt loam	Mesic Typic Hapludalf
TNC 57	5	Loam	Mesic Typic Argiudoll
TNC 56	5	Loam	Mesic Typic Argiudoll
TNC 55	5	Loam	Mesic Typic Hapludoll
TNC 53	8	Silt loam	Mesic Typic Hapludalf
TNC 52	8	Loam	Mesic Typic Hapludoll
TNC 25	9	Loam	Mesic Typic Hapludoll
TNC 15	13	Loam	Mesic Typic Argiudoll
TNC 37	16	Loam	Mesic Typic Argiudoll
TNC 31	16	Loam	Mesic Typic Argiudoll
TNC 13	21	Loam	Mesic Typic Argiudoll
TNC 12	20	Loam	Mesic Typic Argiudoll
TNC 9	16	Loam	Mesic Aquic Argiudoll

Table 3.1 (continued)

TNC 7	21	Loam	Mesic Typic Argiudoll
Remnant 1	Prairie	Loam	Mesic Typic Argiudoll
Remnant 2	Prairie	Loam	Mesic Lithic Hapludolls

Table 3.2: Macroinvertebrate community composition comparisons between agricultural fields, each restoration prairie (RP) age class, and remnant prairie. The ANOSIM generated R value ranges from -1.0 to 1.0; level of significance for each comparison indicated by the P-value. Significant differences indicated in bold.

Restored Prairie Age	**0 y**	**1 y**	**5 y**	**8/9 y**	**13 y**	**16 y**	**20/21 y**
1 y	R=0.11						
	P=0.083						
5 y	**R=0.68**	**R=0.33**					
	***P*<0.001**	***P*<0.001**					
8, 9 y	**R=0.55**	**R=0.28**	R=0.02				
	***P*<0.001**	***P*<0.001**	*P*=0.230				
13-y	**R=0.59**	**R=0.45**	**R=0.80**	**R=0.50**			
	***P*<0.001**	***P*=0.002**	***P*<0.001**	***P*=0.002**			
16-y	**R=0.41**	R=0.08	R=0.08	R=0.027	**R=0.55**		
	***P*=0.001**	*P*=0.058	P=0.065	*P*=0.187	***P*<0.001**		
20/21 y	**R=0.20**	R=0.059	**R=0.37**	**R=0.29**	**R=0.5**	**R=0.14**	

Table 3.2 (continued)

	***P*=0.013**	*P*=0.104	***P*<0.001**	***P*=0.002**	***P*=0.003**	***P*=0.025**	
Remnants	**R=0.48**	R=0.06	**R=0.44**	**R=0.68**	**R=0.65**	**R=0.18**	R=0.11
	***P*=0.003**	*P*=0.213	***P*<0.001**	***P*=0.005**	***P*<0.001**	***P*=0.021**	*P*=0.061

Table 3.3: Indicator taxa organized by site. Indicator value based on a taxon's fidelity and constancy to each site. Significance was determined using a permutation test.

Site classification	**Taxon**	**Indicator Value**	**P Value**
Active agricultural Field	*Bimastos longicinctus* (Haplotaxida: Lumbricidae)	15.0	0.047
Active agricultural Field	Scarabaeidae adult #5 (Coleoptera)	20.0	0.023
Active agricultural Field	Staphylinidae adult #4 (Coleoptera)	30.0	0.001
1 year restoration	Cantharidae larvae (Coleoptera)	24.1	0.013
1 year restoration	Carabidae larvae (Coleoptera)	32.2	0.003
1 year restoration	*Stenolophus* spp. (Coleoptera: Carabidae)	35.1	0.006
1 year restoration	*Harpalus* spp. (Coleoptera: Carabidae)	30.0	0.004
5 year restoration	*Lasius neoniger* (Hymenoptera: Formicidae)	35.5	0.012
5 year restoration	Lamiinae (Coleoptera: Lamiidae)	15.0	0.032
13 year restorations	Formicidae larvae (Hymenoptera: Formicidae)	32.2	0.028
13 year restorations	*Lasius claviger* (Hymenoptera: Formicidae)	25.6	0.020
13 year restorations	Scarabaeidae adult #2 (Coleoptera)	75.8	0.001
13 year restorations	Cicindelidae larvae (Coleoptera)	16.0	0.052
13 year restorations	Henicopidae (Lithiobiomorpha)	48.8	0.001
13 year restorations	Opiliones	17.1	0.047
13 year restorations	Emisinae (Hemiptera: Reduviidae)	20.0	0.042
13 year restorations	Lepidoptera adult	20.0	0.042
16 year Restorations	Staphylinidae adult #1 (Coleoptera)	29.7	0.001
Remnant Prairie	Earthworm juvenile (Haplotaxida: Lumbricidae)	28.9	0.006

Table 3.3 (continued)

Remnant Prairie	*Lumbricus* spp. (Haplotaxida: Lumbricidae)	24.3	0.008
Remnant Prairie	*Myrmica* spp. (Hymenoptera: Formicidae)	36.5	0.052
Remnant Prairie	*Temnothorax* spp. (Hymenoptera: Formicidae)	23.7	0.015
Remnant Prairie	*Ponera spp.* (Hymenoptera: Formicidae)	24.7	0.048
Remnant Prairie	*Paratrechina* spp. (Hymenoptera: Formicidae)	47.7	0.004
Remnant Prairie	*Stenamma* spp. (Hymenoptera: Formicidae)	19.5	0.059
Remnant Prairie	*Brachymyrmex* spp. (Hymenoptera: Formicidae)	20.0	0.017
Remnant Prairie	*Aphaenogaster* spp. (Hymenoptera: Formicidae)	29.3	0.010
Remnant Prairie	Julidae (Julida)	34.3	0.007
Remnant Prairie	*Oniscus* spp. (Isopoda: Oniscidae)	16.4	0.048
Remnant Prairie	Fulgoridae nymph (Hemiptera)	16.7	0.041

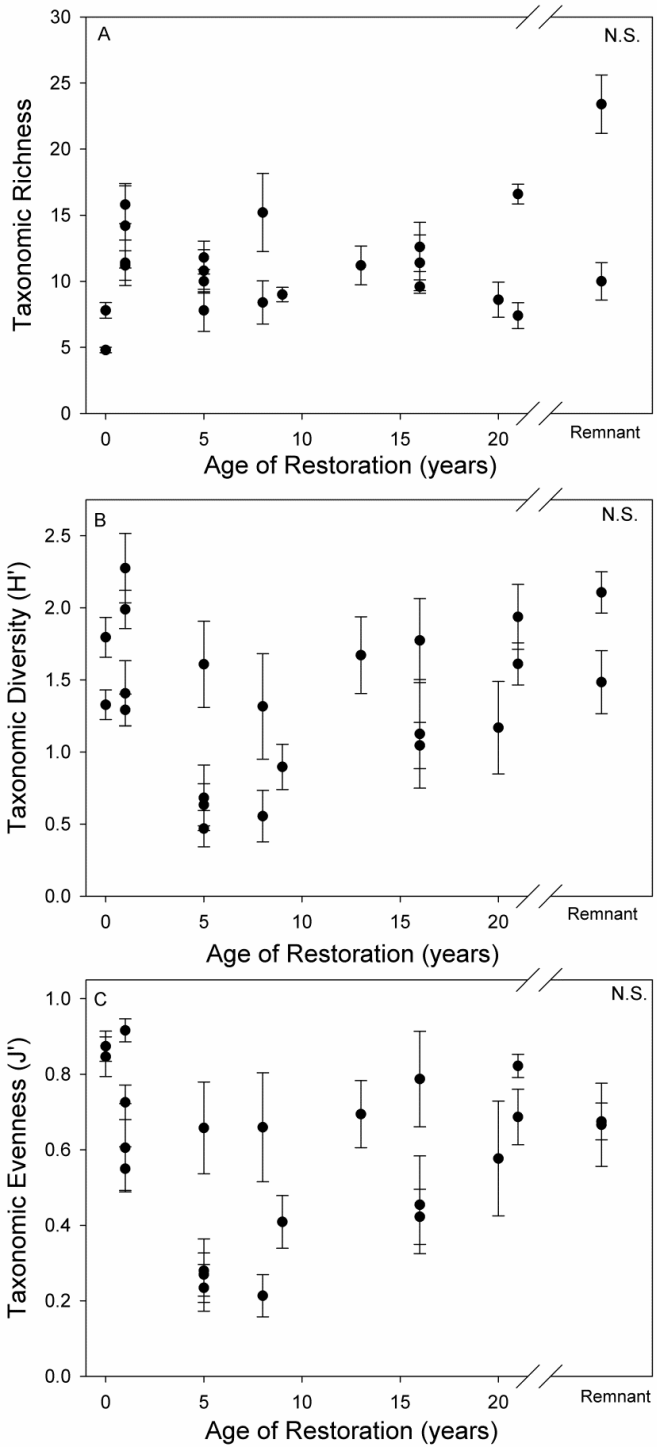

Figure 3.1: Mean (A) taxonomic richness (morphospecies), (B) Shannon's diversity, and (C) evenness of belowground macroinvertebrates across a prairie restoration chronosequence. Standard errors indicated within-field variability. Remnant prairies were not included in regression analyses.

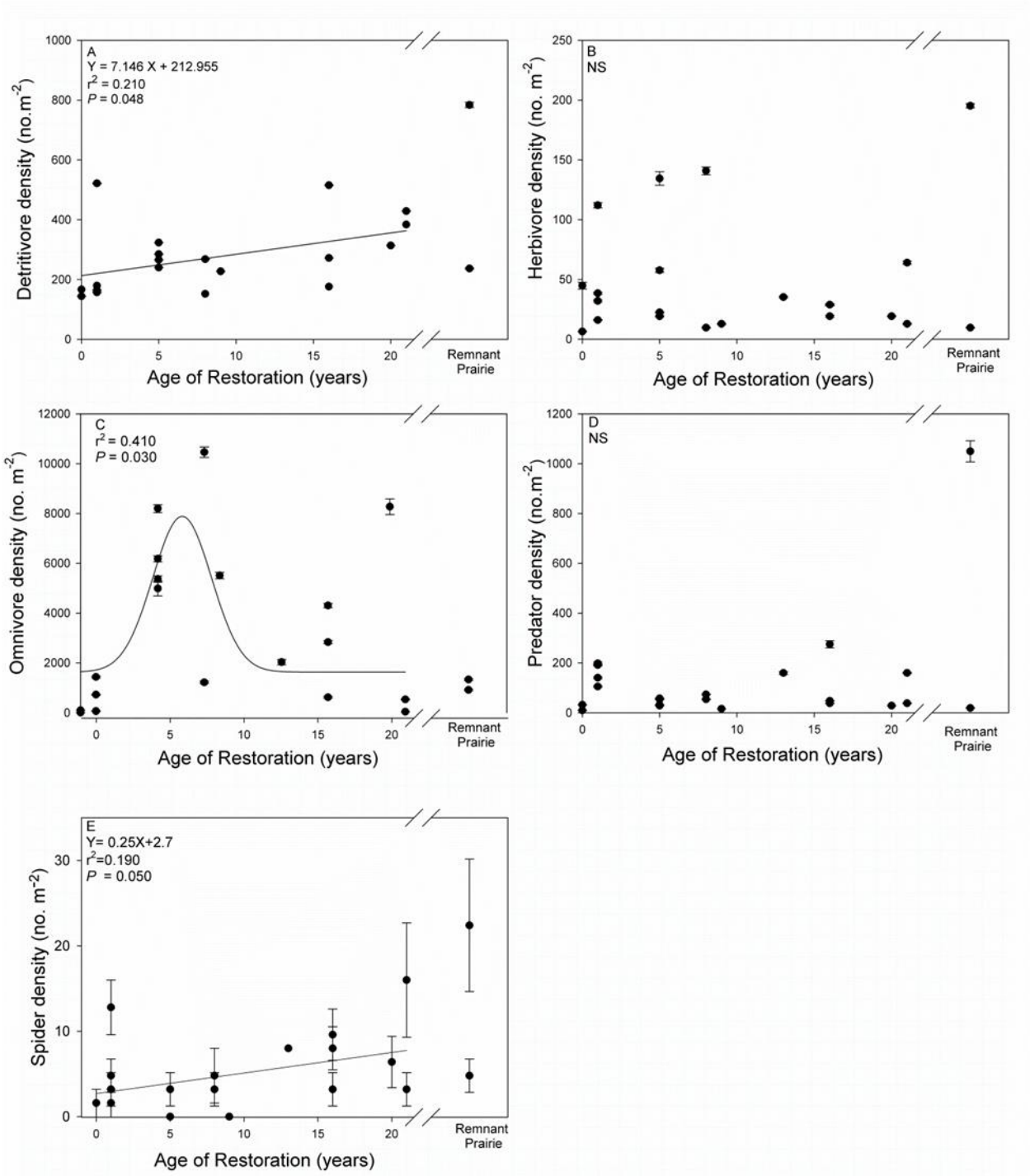

Figure 3.2: Mean ± standard error density of (A) detritivores, (B) predators, (C) omnivores, and (D) herbivores across the restoration chronosequence. The inset graph in panel B shows density of spiders. Standard errors indicate within field variability. Remnant prairies were not included in regression analysis.

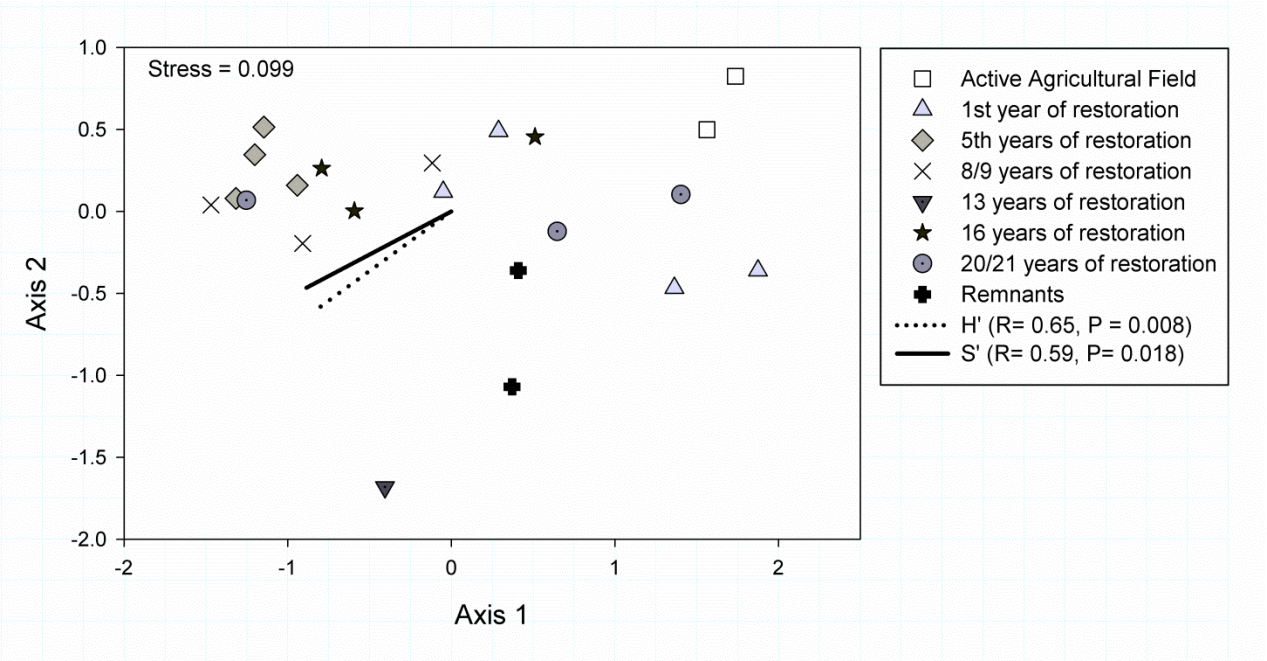

Figure 3.3: Two dimensional non-metric multidimensional scaling ordination of the macroinvertebrate community (Stress = 0.099). Correlation (R) and significance (P-value) of restoration age, plant diversity, and plant richness vectors are overlain the ordination.

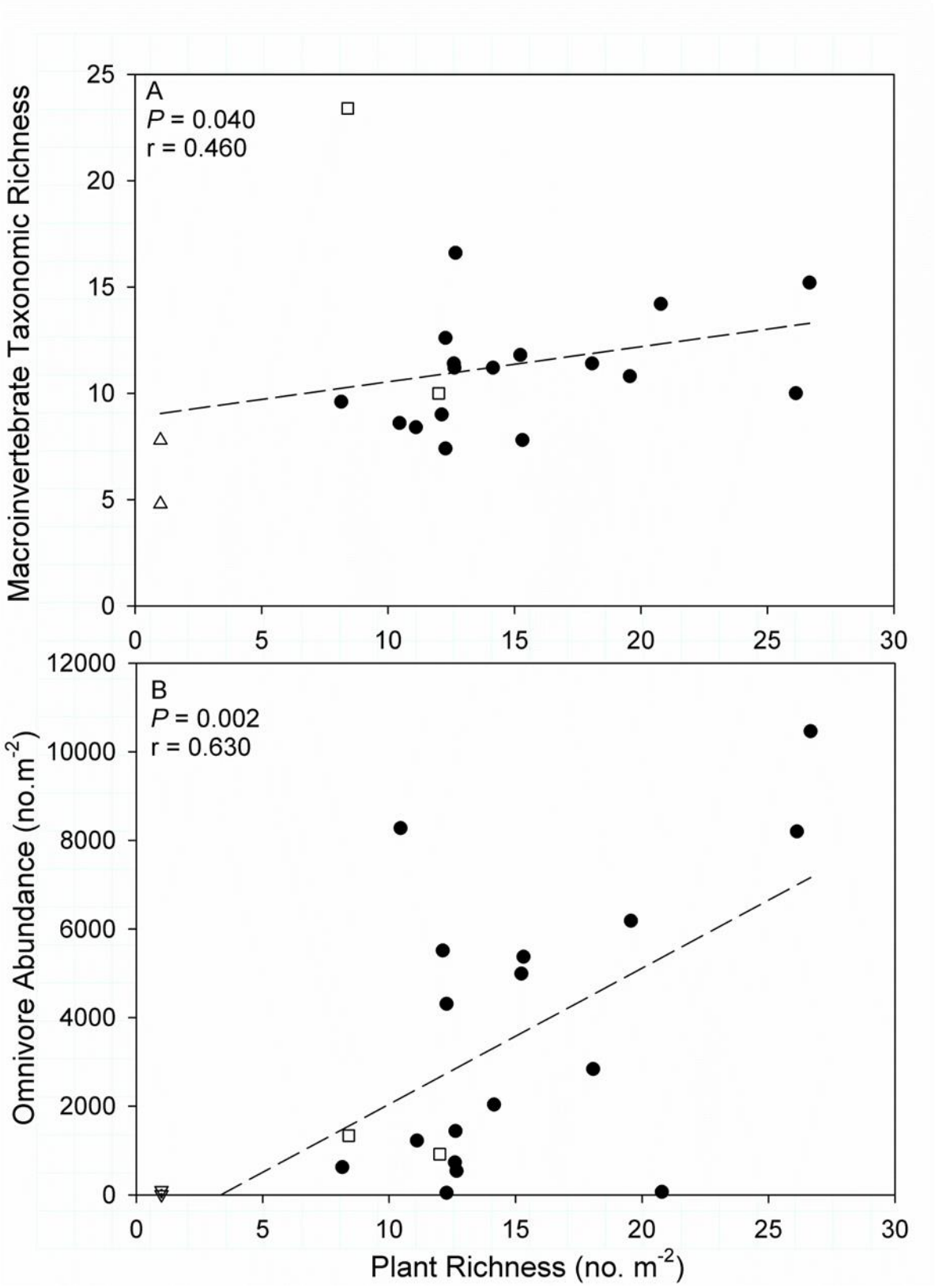

Figure 3.4: Relationship between macroinvertebrate taxonomic richness, omnivore density, and herbivore density with plant species richness.

Figure 3.5: Proportional similarity (PS) across the restoration chronosequence compared to (A) Isabell's Remnant, (B) Thelma Carpenter Remnant, and (C) a composite remnant calculated from the mean similarity of each remnant.

CHAPTER 4

ABOVEGROUND INVERTEBRATE COMMUNITY COMPOSITION RESPONSE TO RESTORED PLANT SPECIES DESIGN POOLS AND SOURCE OF DOMINANT GRASSES

Introduction

Publication of "On the Origin of Species by Means of Natural Selection" in 1859 was a major step in recognizing the importance of intraspecific variation among plants and animals (Darwin, 1859). Several decades later, the term 'ecotype' was coined to describe populations that contain genetically-based local adaptations to environmental conditions (Turesson 1922b; Turesson 1922a). The concept of ecotypes gained appreciation as disjunct plant populations were discovered to contain rare alleles important for long term fitness (Falk 1990; Lesica and Allendorf 1995). Genetic and ecotypic variation is increasingly being documented in dominant grasses of the tallgrass prairie (Gibson et al. 2013; Olsen et al. 2013; Gray et al. in press). Genetic variation can also arise from artificial selection. Gustafson et al. (2004) demonstrated that a cultivated variety (cultivar) of a dominant prairie grass contained a different genetic structure relative to native ecotypes. A long-term field test has shown little effect of cultivars on plant community structure and ecosystem processes during prairie restoration (Gibson et al. 2013; Baer et al. 2014), but the response of higher trophic levels to intraspecific variation in dominant grasses has not been examined. Alternatively, interspecific variation in the plant community may be an equivalent or larger role in structuring the aboveground macroinvertebrate community.

The emerging field of community genetics is heightening ecologists' awareness and understanding of feedbacks between genes, individuals, populations, and communities (Crutsinger et al. 2006; Whitham et al. 2006; Bailey et al. 2009). Variation in plant genetics can be important in structuring invertebrate communities to result in the understanding that foundation species' genetics extend to produce a community phenotype (Wimp et al. 2005; Crutsinger et al. 2006; Bailey et al. 2009; Johnson et al. 2009). Multiple studies have found different herbivore communities dependent on plants with different genotypes (Whitham et al. 2003; Wimp et al. 2005; Bangert et al. 2006; Bailey et al. 2009; Maddox & Root 1987; Fritz & Price 1988; Johnson & Agrawal 2005; Johnson, 2008). For example, Johnson 2008 found intraspecific variation in *Oenothera biennis* induced a tritrophic interaction. Plant genotype influenced the densities of aphids and aphid tending ants in addition to predator species richness.

In addition to plant intraspecific variation, the structure and composition of plant communities (richness, diversity, and cover of functional groups) may influence the composition of higher trophic levels. Southwood (1979) found increased plant structural complexity supported a greater diversity of insects in secondary succession even as plant diversity decreased. Plant diversity along with arthropod predators and parasites were important predictors of arthropod richness and abundance in experimental grasslands (Siemann 1998). More recently, Schaffers et al (2008) showed that plant community composition was a better predictor of arthropod community structure than vegetation structure, landscape factors or environmental conditions.

The overall objective of this study was to examine the role intraspecific variation in plant foundation species source and community composition on aboveground invertebrates, an important higher trophic level in grasslands (Charlton and Whiles 2006). The generality of seed

source (cultivar vs. local ecotypes) effect on invertebrates was evaluated using two different grassland field experiments: one sown with different subordinate species (three unique species pools) and a second seeded with the same number of subordinate species, but variation in their sown abundances (high and low diversity). These experiments tested the overall hypothesis that dominant species source (cultivar or non-cultivar) would influence invertebrate community structure. Since two studies have since shown no strong effect of dominant grass source on community structure and aboveground productivity (Gibson et al. 2013; Baer et al. 2014), I expected the effect of source to be non-significant or weak. I hypothesized that plant species composition (different species pools) would influence the composition of the invertebrate community because different plant communities are generally associated with different invertebrate communities (Wimp et al. 2005; Bangert et al. 2006). Finally, I hypothesized that plant communities with higher diversity would support a great number and diversity of invertebrates due to an increase in energy and partitioning of resources (Evans et al. 2005).

Methods

Study Site

Two experimental prairie restorations were established to test the 'extended phenotype hypothesis' in restored grassland communities. The first field experiment, SICE (Southern Illinois Cultivar Experiment), was located at the Southern Illinois Agronomy Center in

Carbondale Illinois (Jackson County 37.73° N, 89.22° W). Soils at the Agronomy Center are a silty clay loam and developed under a continental climate with an average temperature of 13.4° C. In the year of study, 2010, total precipitation was 1545 mm y^{-1}. The 30 year average has been 1212 mm y^{-1}.

The second experiment was also established in a former agricultural field, but located at Southern Illinois University's Belleville Research Station located in Belleville, IL (38° 31′ N, 89° 50′ W). The soil is a Cowden silt loam that had been in a soybean (*Glycine max*), corn (*Zea mays)* and wheat rotation. In the year of the study, 2009, total precipitation was 1367 mm with an average temperature of 13.61. Both sites experienced an annual fire regime to control weeds and promote establishment of the desired native prairie species.

Experimental Designs

At the Southern Illinois University Agronomy Center, the experiment consisted of a split plot design, with whole plots arranged in a randomized complete block design (Figure 4.1). Twelve whole plots (23 m x 7 m) were laid out in two blocks (n= 6 per block) to account for different agricultural histories at the site. Whole plots were randomly assigned a cultivar or local ecotype dominant grass seed source. Cultivars were developed by the United States Department of Agriculture (USDA 1995). Cultivars used in the experiments were: *Andropogon gerardii* Vitman "Rountree', *Sorghastrum nutans* (L), 'Rumsey', and *Schizachyrium scoparium* Michx. Nash 'Aldous.' Local ecotypes of these species were collected from Faulkner R.R. prairie preserve, Wildcat Bluff nature preserve, Cave Creek nature preserve, and Fult's Hill Prairie

nature preserve in southern Illinois. Due to low seed viability, a small amount (~5%) of Missouri ecotype seed of *A. gerardii* was used to fulfill the targeted live seeding. Within each whole plot, 5 m x 5 m subplots (n=36, n= 3 per whole plot) were sown to one of three randomly assigned species pools. Each species pool consisted of 15 non-overlapping common species in prairie. Each species pools contained the same number of functional groups (C_4 grass, C_3 grass, forb, legume), and species within each functional group (Table 4.1). Seeds of each of the three dominant grass species were sown at a rate of 100 live seeds/m^2. Each of the 15 non-dominant species were seeded at a rate of 20 live seeds/m^2 for a total subordinate species seeding rate of 300 seeds m^2.

The Belleville experiment was established in the winter of 2005. The experimental design was split plot, with 25 m x 5 m whole plots assigned to dominant grass source (cultivar or 'Missouri local ecotype') according to a completely randomized design (Figures 4.3 and 4.4). Whole plots were further divided into five 5 m x 5 m subplots and sown with a decreasing proportional abundance of 15 other prairie species, with total plant richness held constant (Figure 4.2). The total seeding rate was constant among subplots, but they were sown with sequentially less (97%, 87%, 60%, 40%, and 20%) dominant grass species (Figures 4.2 and 4.3). A 5 m buffer was sown with *Bouteloua curtipendula* between each whole plot.

The same USDA cultivars of *Andropogon gerardii*, *Sorghastrum nutans*, and *Schizachyrium scoparium* were used in both field experiments. Due to limited availability of seed from remnant populations, a commercially-available "local ecotype" source of each dominant grass was used (purchased from Hamilton Native Seed Company, Hamilton, Missouri). The fifteen other species sown were: *Achillea millefolium* L., *Asclepias tuberosa* L., *Aster oblongifolium* (Nutt.) Nesom, Baptisia *leucantha* L., *Bouteloua curtipendula* (Michx.) Torr.,

Dalea candida Michx ex. Willd., *Desmanthus illinoensis* (Michx.), *Delphinium virescens* Nutt., *Elymus canadensis* L., *Liatris pycnostachya* Michx., *Lespedeza capitata* Michx., *Monarda fistulosa* L., *Oenothera macrocarpa* Nutt., *Rudbeckia hirta* L., and *Solidago speciosa* Nutt.

Aboveground Macroinvertebrate Sampling

Macroinvertebrates were sampled from all subplots in the SICE subplots and two subplot treatments (87% and 40% grass dominance) in the BDE. Macroinvertebrates were collected using a vacuum drop trap (Meyer et al. 2002). The vacuum drop trap consisted of a plastic tube ($0.25m^2$) fitted with nylon mesh surrounding the intake tube of a 25 cc gasoline powered leaf blower. A fine mesh collecting bag was secured to the inside of the blower allowing the invertebrates to be captured while methodically vacuuming the vegetation within the 0.25 m^2 drop trap for 120 seconds. The vacuum drop trap sampling technique was chosen over other sampling methods such as sweep netting to allow quantitative comparisons between samples collected from each subplot. Samples from each subplot were transferred to plastic bags in the field, and placed on ice, until they could be frozen in the laboratory. Sampling occurred between 10 am – 2 pm when temperatures exceeded 21°C, and winds were below 21 KPH. The field experiments in Belleville and Carbondale, IL were sampled on August 12, 2009 and August 31, 2010, respectively. Sampling was performed in August to correspond with peak plant biomass.

Plant community structure and biomass

Plant canopy cover was visually estimated from a centrally positioned 1 m^2 permanent quadrat located in each subplot immediately following the invertebrate sampling from SICE and BDE (Appendix I, and M). Aboveground plant productivity was estimated in SICE only by harvesting biomass from four randomly located 20 x 50 cm (0.1 m^2) areas surrounding the permanent vegetation quadrat in the fall corresponding to maximum productivity. Clipped biomass was dried for 1 week at 55° C and weighed.

Macroinvertebrate identification

In the laboratory, macroinvertebrates were separated from plant matter and sorted to family using Triplehorn et al. (2005). Specimens were placed in vials containing 70% ethanol (ETOH). All macroinvertebrates were assigned to morphospecies, with the exception of ants, were identified to genera using Fisher and Cover (2007) and spiders to genera using Cushing and Ubick (2009). Lepidopteron larvae could not be reliably identified to family because they were preserved in ETOH. An image reference collection was created for morphospecies using a digital camera mounted on a stereomicroscope. The morphospecies technique is useful when an entire invertebrate assemblage is of interest (Litt & Steidl 2010). To understand the potential role seed source, plant diversity and community may have at different trophic levels, macroinvertebrates

were assigned to trophic groups [(predator, herbivore, omnivore and detritivore) appendix K and O] based on information in the literature (Triplehorn 2005; Fisher 2007; Cushing 2009).

Statistical analysis

Macroinvertebrate abundance, morphospecies diversity indices, and trophic group response to dominant species seed source (cultivar/non-cultivar), species pool (SICE only), plant diversity (BDE only) and potential interactions of these factors in the respective field experiments were examined using the mixed model procedure in SAS 9.3 (SAS insitutute 2011). Least square means with estimate and contrast statements were used to examine possible differences between treatments (Appendix J and N). Spearman's correlations were used to examine relationships between the plant community structure (richness, diversity, and productivity) and macroinvertebrate community structure (richness, diversity, and abundance).

Non-metric multidimensional scaling (NMDS) was used to examine potential differences in the macroinvertebrate community in response to the manipulated factors in each field experiment. The Bray-Curtis dissimilarity measure was selected with 999 permutations using invertebrate abundances. Potential solutions were analyzed with up to 4 dimensions in Primer (Clarke 2006). Selection of an NMDS solution was based on low stress (a measure of fit), number of dimensions, and interpretability (McCune and Grace). PERMANOVA was used to test for potential differences in the invertebrate community's response to seed source, species pool (SICE only), and plant diversity (BDE only). PERMANOVA is a technique that allows a

multivariate dataset from ANOVA type experimental designs to best tested with a pseudo F value and permutation test (McCune 2002).

Results

SICE: Dominant Grass Source and Species Pool Effects

A total of 285 macroinvertebrates representing 102 morphospecies were collected from the 36 SICE subplots (Appendix H). Total macroinvertebrate abundance was not different between the dominant grass source or among the species pool treatments (Figure 4.4). Dominant grass source also did not strongly affect macroinvertebrate morphospecies richness (Figure 4.5 A) or Shannon's diversity (Figure 4.5B), but species pool A had slightly higher Shannon's diversity than species pool C ($F_{2,20} = 3.26$, $P = 0.085$; Figure 4.5 C).

Macroinvertebrate trophic groups showed little response to source and species pool treatments. Herbivores exhibited a weak source x species pool interaction ($F_{1,20}=3.42$, $P = 0.079$). In species pool A, the cultivar treatment supported more than twice the number of herbivores than the local ecotype treatment, but herbivore abundance was similar between the grass sources in species pool B and C (Figure 4.6). Omnivore, predator, and detritivore abundances were not influenced by the source, species pool treatment or their interaction (Figure 4.6 B-D).

A closer investigation of specific herbivore groups showed Orthoptera and Lepidoptera abundances contributed to the interaction between the source and species pool treatments. Orthoptera was ~ 3 times more abundant ($F_{1,29} = 6.47$, $P = 0.017$) in the cultivar than the non-cultivar treatment in species pool A (Figure 4.7). The cultivar treatment of species pool A also supported more Orthopterans relative to the cultivar treatment in species pools B and C ($F_{1,29} = 7.59$, $P = 0.01$, and $F_{1,29} = 12.98$, $P = 0.001$ respectively). Lepidopterans were approximately 2 times more abundant in the species pool A's cultivar treatment than any of the other treatments ($F_{1,28.7}, = 5.53$, $P<0.02$; Figure 4.8 A). Abundances of these two groups of herbivores were low or absent in most subplots, but two subplots both in the cultivar treatment of species pool A had elevated abundances that were responsible for the significant relationship found.

The Omnivores as a trophic group were not responsive to the source or species pool treatments. Omnivorous Hymenoptera however, were responsive to the species pool (Figure 4.9). Hymenopterans were ~5 times more abundant in species pool A than C ($F_{1,20} = 2.01$, $P = 0.058$).

Examination of the macroinvertebrate community by major taxonomic groups reveals that many major taxonomic orders did not respond to the source of species pool treatments. Araneae, Coleoptera, Diptera, Formicidae, Hemiptera, and Homoptera were not responsive to either the source or species pool treatment (Figure 4.10 A- F). Macroinvertebrate richness and diversity were not influenced by plant richness or diversity (Figure 4 .11 A and B), and their total abundance, morphospecies richness, and morphospecies diversity were not influenced the aboveground biomass production (Figure 4. 12 A, B and C respectively).

A two dimensional NMDS solution was retained for examination of the macroinvertebrate community's response to the dominant seed source and species pool

treatments (Figure 4.13). Most of the subplots were very similar based on a tight clumping pattern, but four subplots were dissimilar. For presentation purposes, the four subplots were removed from the ordination, and the remaining subplots are displayed (Figure 4.13 Inset). The PERMANOVA test found no differences in the macroinvertebrate community's response to the source treatment or diversity treatments.

BDE: Dominant Grass Source and Sown-Diversity Effects

A total of 566 specimens representing 119 morphospecies were collected from the experiment that manipulated dominant grass source and dominance (appendix L). Total macroinvertebrate abundance, morphospecies richness, and morphospecies diversity did not differ between the dominant grass sources or the sown diversity treatments (Figure 4.14; Figure 4.15 A and B).

There was negligible response of dominant grass source and sown diversity on macroinvertebrate trophic group abundances. Herbivores were not responsive to the dominant grass seed source treatment, but there was a marginally significant interaction between dominant grass source and sown diversity. Herbivores abundances were marginally higher ($F_{1,8} = 4.24$, $P = 0.07$) in the non-cultivar low plant diversity treatment relative to the non-cultivar high diversity treatment (Figure 4.16A). Predators were not responsive to the dominant grass source treatment, but did respond to the diversity treatment. Predator abundances were ~25% higher ($F_{1,8} = 5.81$, $P = 0.0425$) in low diversity subplots (Figure 4.16 C & E). Omnivores and detritivores abundances did not respond to any of the experimental treatments (Figure 4.16 B and D).

Examination of the major taxonomic groups in the macroinvertebrate community reveals that most orders did not respond to the source of species pool treatments (figure 4.17 A-I). Araneae, Coleoptera, Diptera, Formicidae, Hemiptera, Hymenoptera, Lepidoptera, and Orthoptera were not responsive to either the source or species pool treatment. Homopterans however exhibited weak response to the source and diversity treatments. In the high diversity subplots, Homoptera abundances were marginally higher ($F_{1, 13} = 3.68$, $P = 0.08$) in the non-cultivar treatment. Additionally, in the non-cultivar treatment, more Homoptera were found in the low diversity subplots ($F_{1,8} = 4,39$, $P = 0.07$).

A 3-D NMDS solution was retained for analysis of the BDE macroinvertebrate community (Figure 4.18). No spatial separation of subplots based on the source or plant diversity treatments were apparent, and the PERMANOVA found no differences in these communities.

Discussion

In this study of aboveground macroinvertebrates inhabiting experimental grasslands, I found little support for different sources of dominant grasses producing an ‘extended phenotype’ (Whitham et al 2003). If macroinvertebrates were responsive to intraspecific variation in traits of the dominant grasses, I expected to find differences in macroinvertebrate abundances, trophic levels, and/or communities due to variability in plant palatability, plant defenses, and tri-trophic interactions (Whitham et al. 2003; Wimp et al. 2005; Johnson 2008).

Features of the plant community such as richness, diversity and productivity are factors that frequently influence macroinvertebrate abundance, diversity, and community structure (Southwood et al 1979; Siemann et al 1998; Siemann et al 1999). In the source and species pool experiment, neither factor influenced the total abundance of macroinvertebrates, or morphospecies richness. This likely resulted from small differences between in plant richness, diversity, and ANPP between the treatments (Siemann 1998). Species pool A (irrespective of source) did have a slightly higher macroinvertebrate diversity value (H'), a finding that may be explained by slightly higher productivity (N.S., unpublished data) in this species pool potentially providing more resources (Evans et al 2005). More likely, species pool A may contain an individual plant species, or particular suite of plant species that are more attractive to arthropods. Similarly, in the source and sown diversity experiment, only slight differences were actually observed between the diversity treatments, thus no differences in macroinvertebrate abundances, or richness and diversity were observed.

Ecological theory predicts that herbivores will respond most strongly to differences in plant traits, and higher trophic levels will respond to plant traits via weaker indirect pathways (Wimp et al. 2005; Moreira & Mooney 2013). Contrary to this, I found few differences in the responses of each trophic level. In Carbondale, herbivores exhibited a weak interaction between source and species pool, which could have resulted from type I error. In Belleville, Homoptera were marginally more abundant in the low diversity non-cultivar subplots. This finding may be an important property of this system, but the lack of a bfbroroader herbivore response to plant source may instead reflect the underlying biology of Homoptera as "high responders" to plant genotypic differences. Tack et al (2012) suggest the utility of a community genetics (extended phenotype) approach will be informed by examining a diversity of taxa with varying

phylogenetic and life histories responses to plant genetics, and not biased by specific high responding taxa or systems. More predators were also found in the low diversity treatment, likely as a direct response to the increased numbers of herbivores, or via "density mediated indirect interaction" (Moreira & Mooney 2013).

While few differences were found in the source treatment, interspecific variation (species pool treatment) did influence the macroinvertebrate community. Species Pool A had slightly higher morphospecies diversity and more hymenopterans than the other two species pools. The presence of the ant-tended legume, *Chamaecrista fasciculata* Michx., in Species Pool A likely explains the increased number of Hymenopterans. This legume has extra floral nectaries at the base of most leaves, which attract ants and tends to decrease herbivory (Abdala-Roberts & Marquis 2007).

Much of the support for the extended phenotype hypothesis is from experiments where plants of different genotypes are spatially separated from other conspecifics. An extended phenotype is that then invoked when different invertebrate communities are found on plants with different genotypes (Fritz & Price 1988; Johnson & Agrawal 2005; Wimp et al. 2005). Recent work has questioned the generality and importance of the extended phenotype in natural communities as many of the positive results are found in hybrid plant systems, with endophageous insects (Tack et al. 2012). Further, the effects of genetic variation are often small and likely diluted by the plant community at larger scales. The current study is unique because grasses with different genotypes were part of a larger plant community similar to more natural settings.

The lack of support for the extended phenotype in this situation was not expected, but may be explained in several ways. First, the source treatment may have been diluted due to the fact that the productivity of the subordinate species comprised over 50% of the biomass in the SICE (Baer et al. 2014). Interestingly, and unexpectedly, the source populations of cultivar and non-cultivar *Sorghastrum nutans* were within 100 km of each other, effectively reducing the amount of genetic variation in the most dominant grass in the experiment. Further, most other studies that support the extended phenotype examined individual plants in the absence of interspecific interactions with other plants (Johnson & Agrawal 2005; Wimp et al. 2005; Tack et al. 2012). Alternatively, the experiments I studied may not provide as robust of a test of the extended phenotype because the experimental grasslands are small, with different plant community treatments adjacent to one another and embedded in an agricultural matrix, which may select for generalist taxa that are unresponsive to genetic variation in the dominant grasses. Finally, the morphospecies level identification allowed for a census of a wide range of taxa, but may have missed cryptic species that could potentially respond to genetic differences in host plants (Litt & Steidl 2010).

In conclusion, these results contribute to the ongoing dialogue regarding "how local is local" in ecological restoration (Jones 2013). Given the equivocal results of macroinvertebrates in these experimental grasslands compared to other experiments supporting the extended phenotype (Wimp et al. 2005), we still do not yet understand how genetic differences in dominant plants influence the macroinvertebrate community. These equivocal results indicate more experimental data is needed to bridge the gap between the plant communities' genetics and higher trophic levels.

Table 4.1. Subplot species pools assignments. Whole plots were seeded with cultivars or local ecotypes of the three dominant prairie grasses.

Species Pool A	**Species Pool B**	**Species Pool C**
Forbs	**Forbs**	**Forbs**
Asclepias tuberosa	*Achillea millefolium*	*Brickellia eupatorioides*
Asclepias verticillata	*Asclepias syriaca*	*Aster oolentangiensis*
Aster oblongifolius	*Echinacea purpurea*	*Heliopsis helianthoides*
Callirhoe involucrata	*Eupatorium altissimum*	*Monarda fistulosa*
Delphinium carolinianum	*Liatris pycnostachya*	*Penstemon digitalis*
Oenothera macrocarpa	*Oenothera biennis*	*Rudbeckia hirta*
Ratibita pinnata	*Oligoneuron rigidum*	*Silphium laciniatum*
Rosa arkansana	*Ruellia humilis*	*Solidago speciosa*
Senecio plattensis	*Silphium integrifolium*	*Vernonia fasciculata*
Legumes	**Legumes**	**Legumes**
Baptisia alba	*Amorpha canescens*	*Astragalus canadensis*
Chamaecrista fasciculata	*Dalea candida*	*Baptisia bracteata*
Psoralidium tenuiflorum	*Desmanthus illinoensis*	*Lespedeza capitata*
Shrankia nutallii	*Desmodium illinoense*	*Dalea purpurea*
C3 Grass	**C3 Grass**	**C3 Grass**
Elymus canadensis	*Koeleria macrantha*	*Agrostis hyemalis*
C4 Grass (Non-dominant)	**C4 Grass (Non-dominant)**	**C4 Grass (Non-dominant)**
Sporobolus heterolepis	*Bouteloua curtipendula*	*Panicum virgatum*

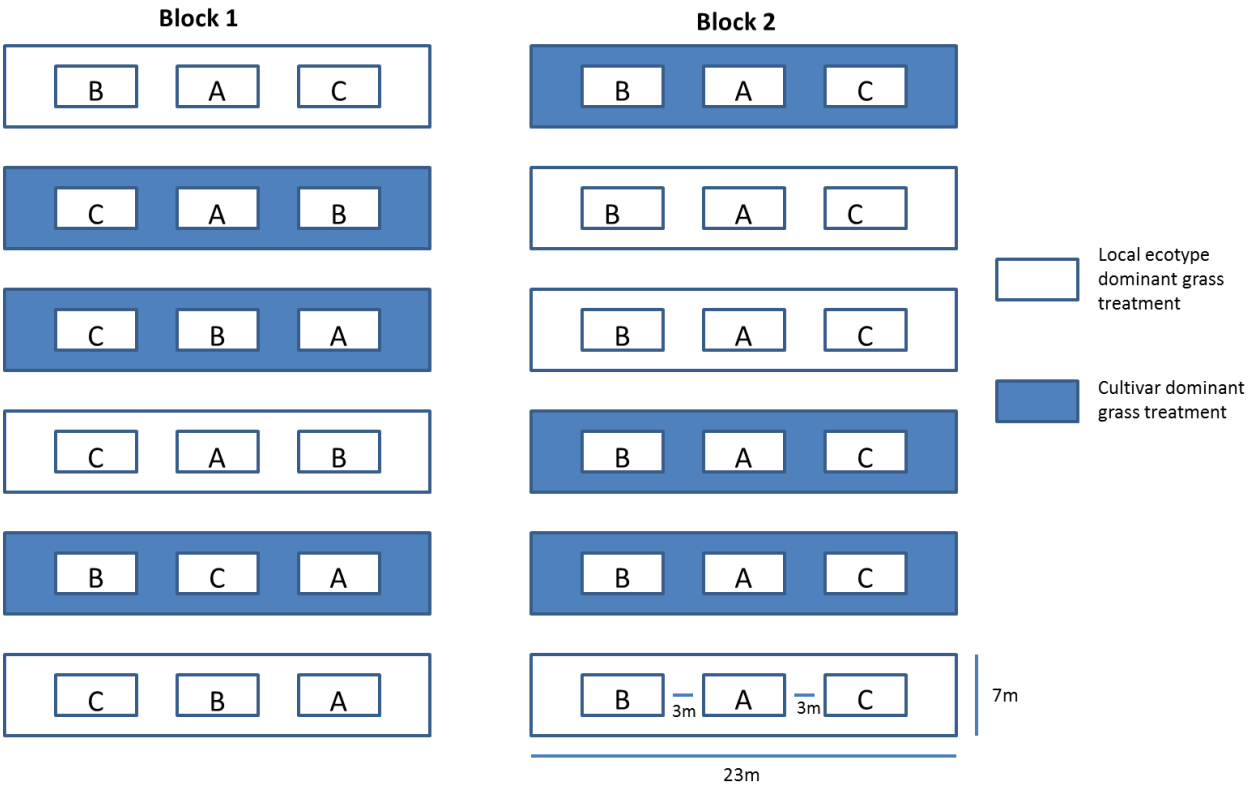

Figure 4.1. Split plot design of the experiment at SIU's Agronomy Center (SICE). Whole plots were seeded with either locally collected ecotypes (white) or cultivars (blue) of the dominant prairie grasses. Subplot species pools assignments represented by the letters A, B, and C.

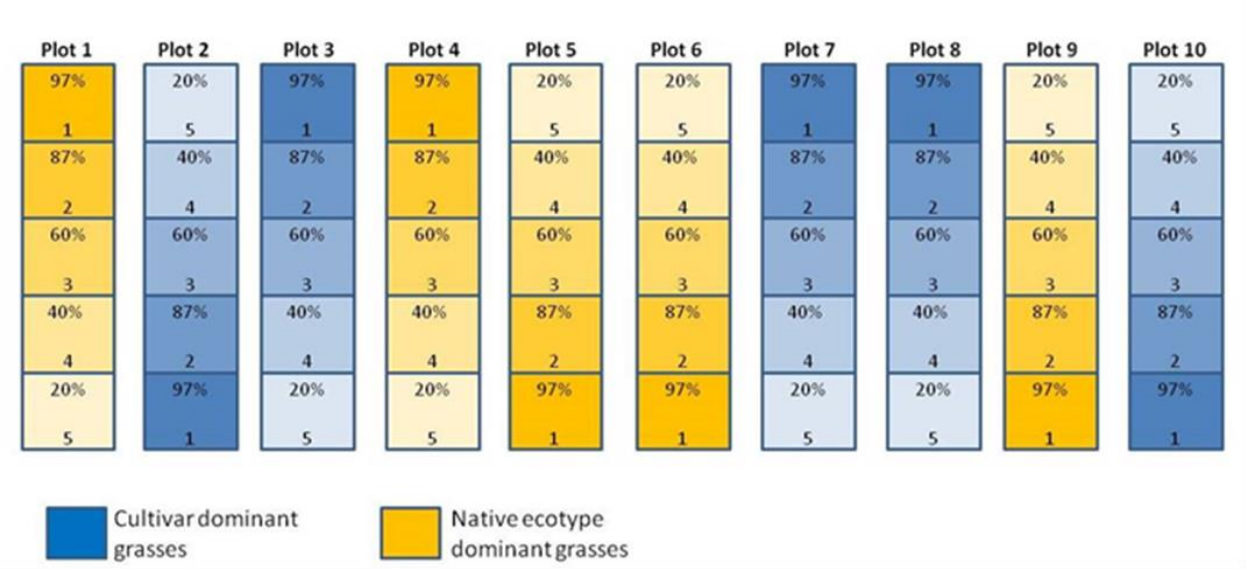

Figure 4.2. Design of the Belleville Dominance Experiment (BDE). Whole plots were seeded with either local ecotypes (orange) or cultivars (blue) of the dominant grasses. The diversity gradient consisted of an altered ratio of seeded dominant grasses:subordinate species (variation in shading of each color)

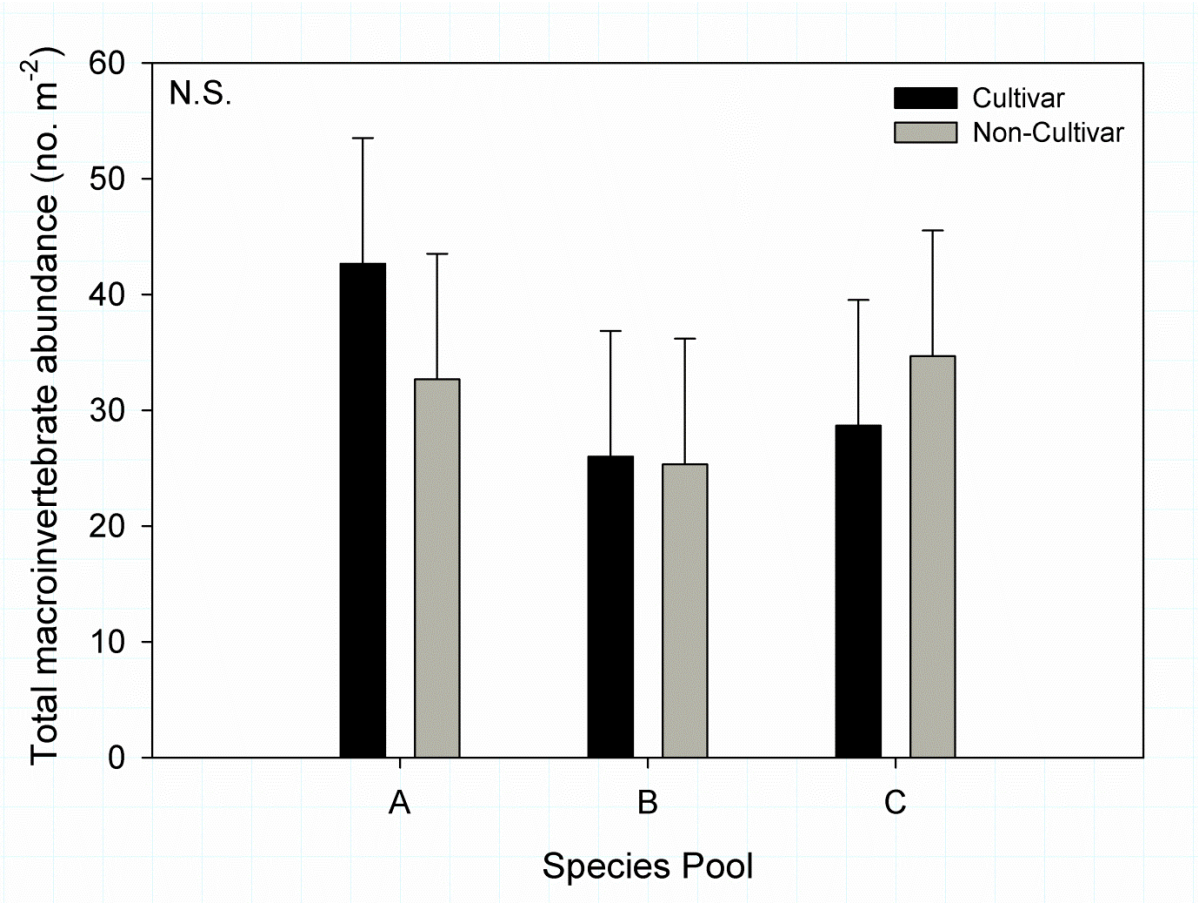

Figure 4.3. Mean (± SE) total macroinvertebrate abundance in species pools and source treatment combinations in Carbondale, IL (SICE). Standard errors indicate variability.

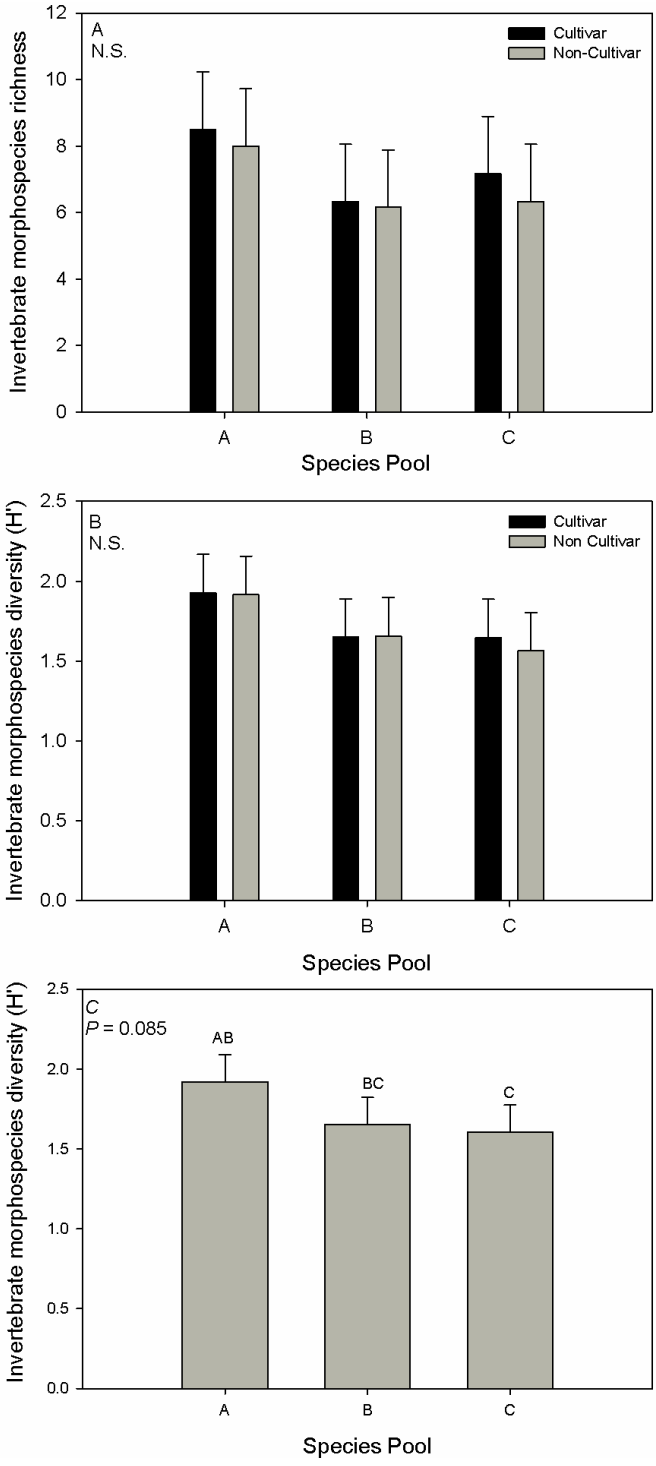

Figure 4.4. Mean (±SE) morphospecies (A) richness, (B and C) diversity in species pool and source treatment combinations in Carbondale, IL (SICE). Standard errors indicate within treatment variability. Bars accompanied by the same letter were not significantly different ($P > 0.05$).

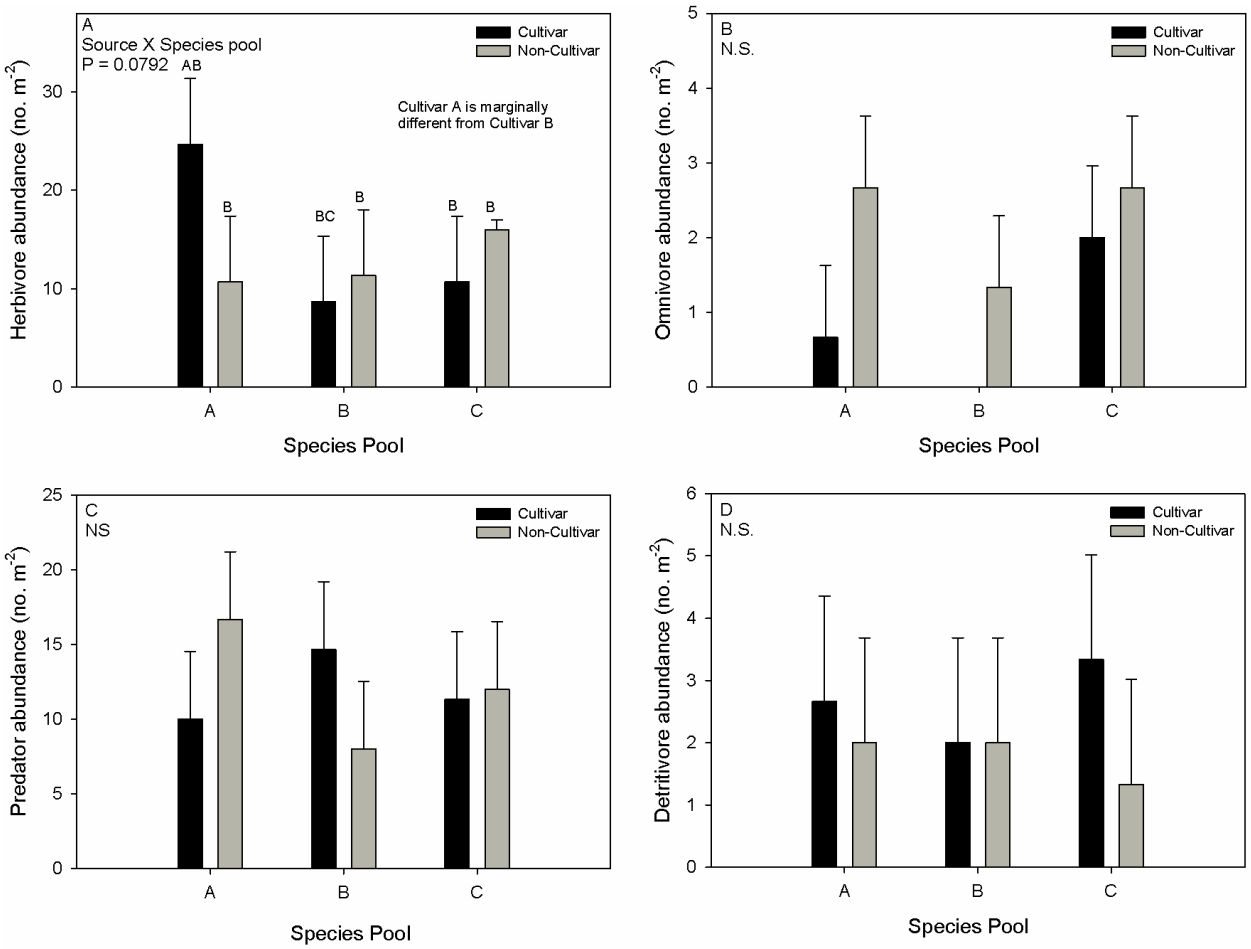

Figure 4.5.Mean (± SE) abundance of (A) herbivores, (B) omnivores, (C) predators, and (D) detritivores in species pool and dominant grass source treatment combinations in Carbondale, IL (SICE). Standard errors indicate within treatment variability.

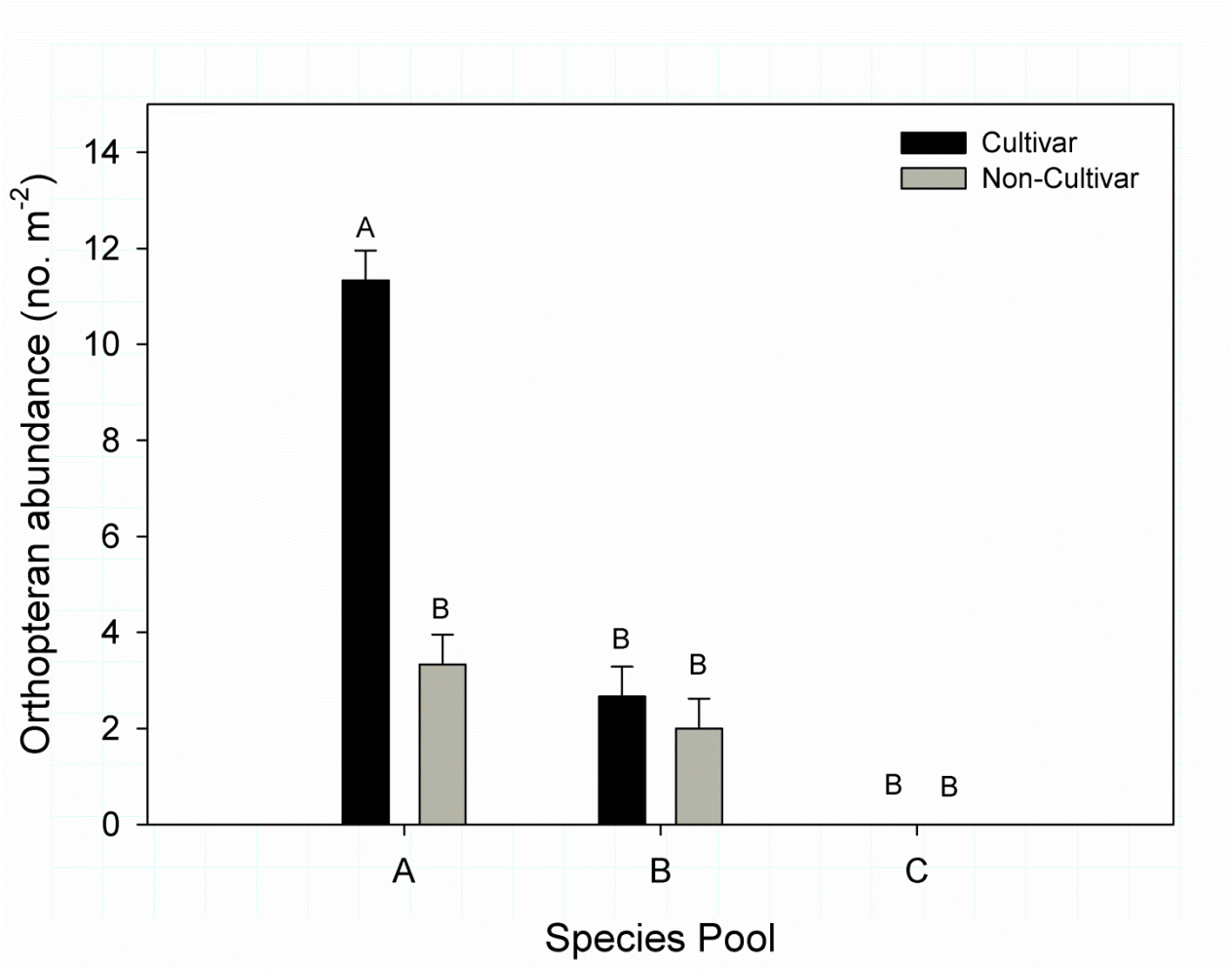

Figure 4.6. Mean (± SE) abundance of Orthoptera in the species pool and dominant grass source treatment combinations in Carbondale, IL (SICE). Standard errors indicate within treatment variability. Means accompanied by the same letter were not significantly different ($P > 0.05$).

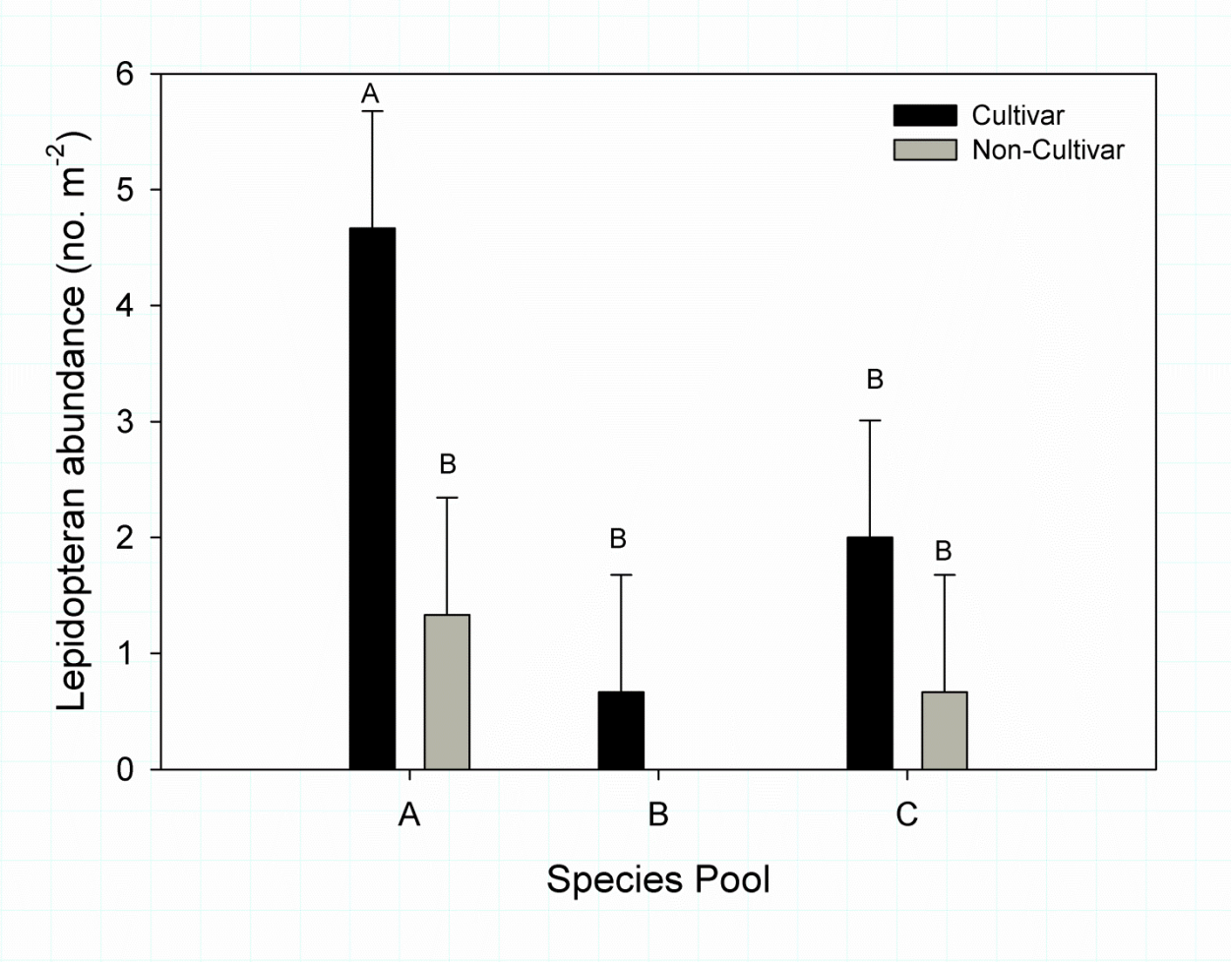

Figure 4.7.Mean (± SE) abundance of Lepidopterans in species pool and dominant grass source treatment combinations in Carbondale, IL (SICE). Standard errors indicate within treatment variability. Means accompanied by the same letter were not significantly different ($P > 0.05$).

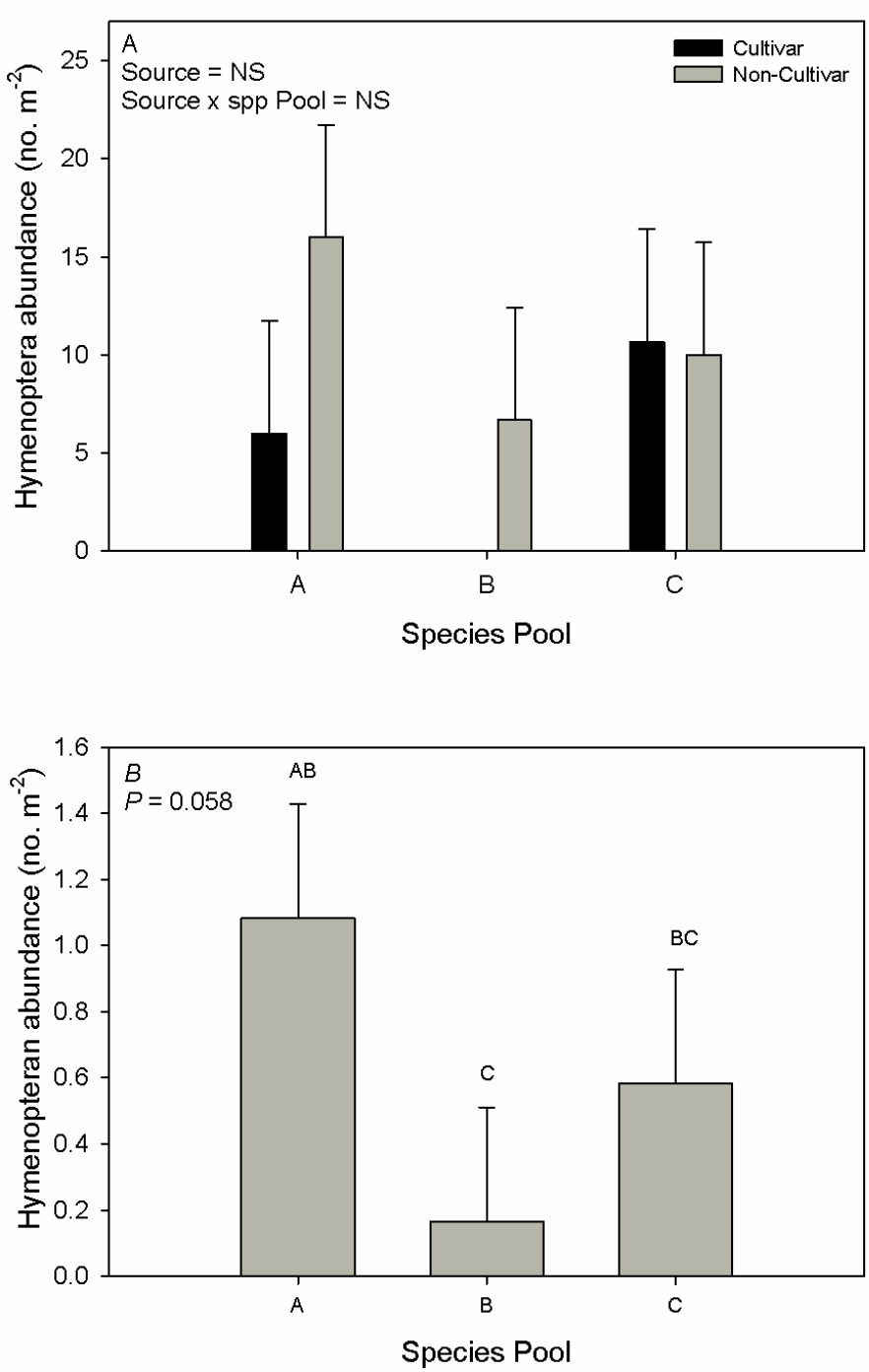

Figure 4.8. Mean (± SE) abundance of Hymenoptera in (A) species pool and source treatment combinations, and (B) species pool treatments only in Carbondale, IL (SICE). Standard errors indicate within treatment variability. Means accompanied by the same letter were not significantly different ($P > 0.05$).

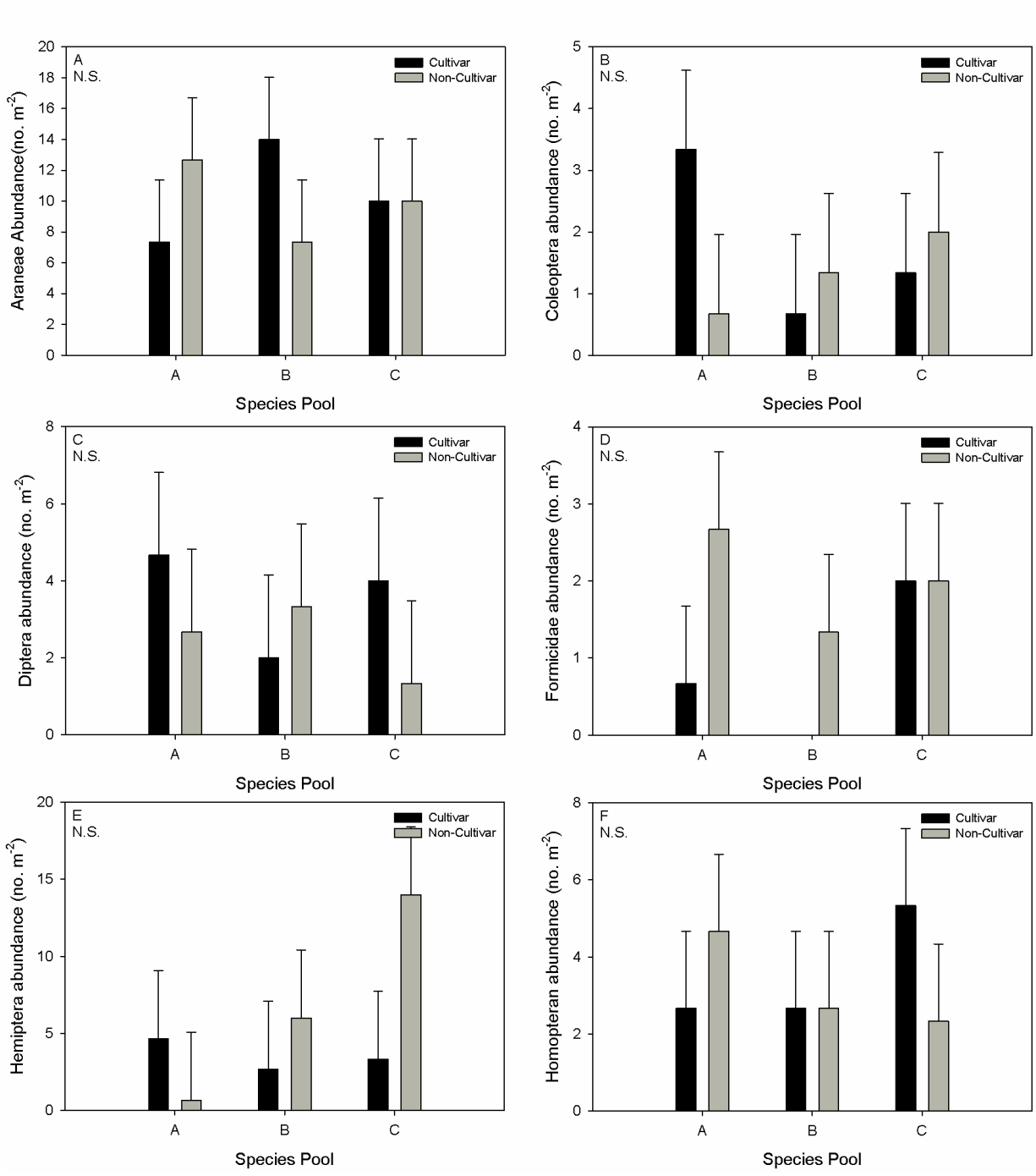

Figure 4.9. Mean (± SE) abundance of (A) Aranea , (B) Coleoptera , (C) Diptera, (D) Formicidae (E) Hemiptera, and (F) Homoptera in species pool and dominant grass source treatment combinations in Carbondale, IL (SICE). Standard errors indicate within treatment variability. Means accompanied by the same letter were not significantly different ($P > 0.05$).

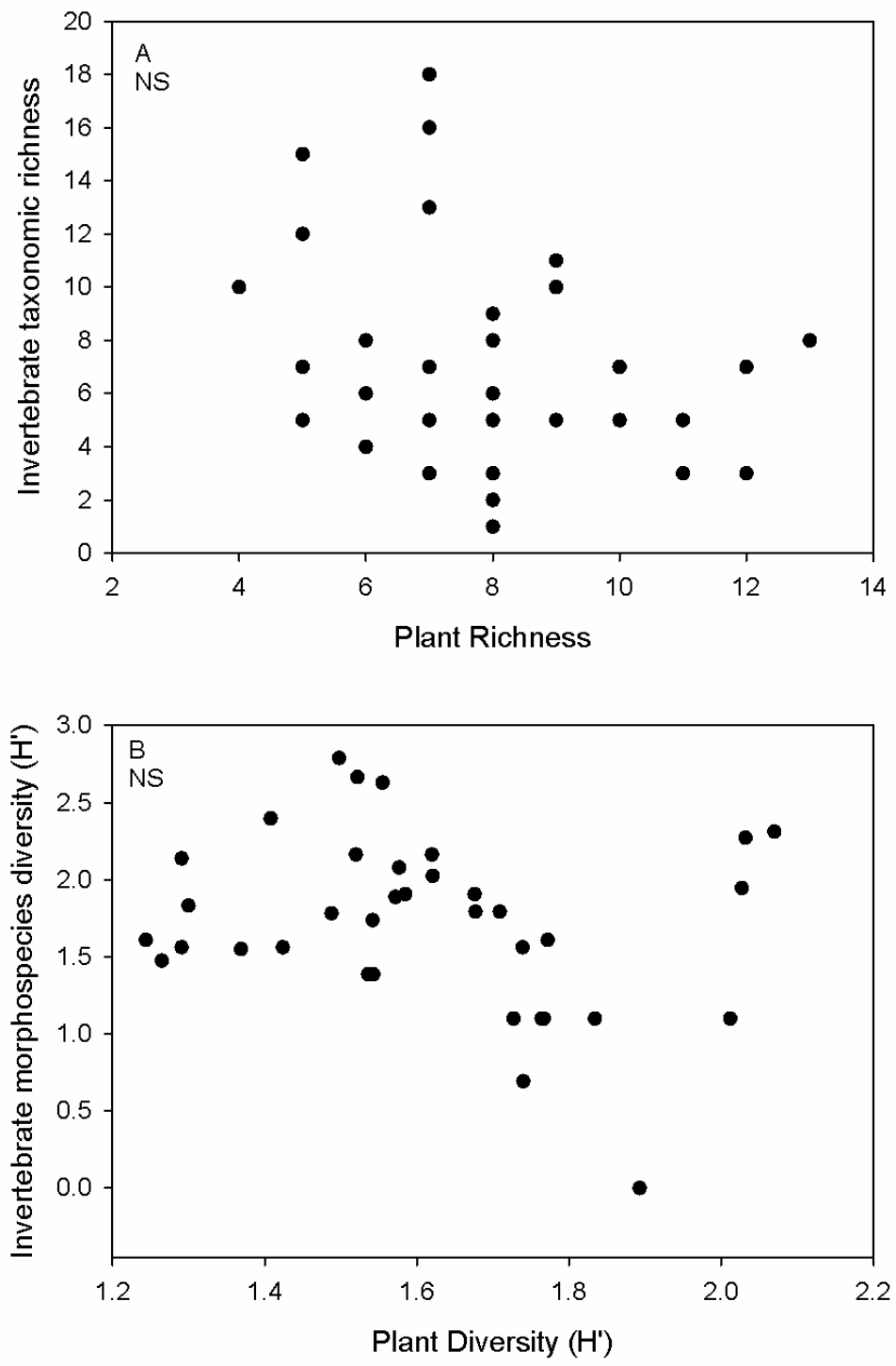

Figure 4.10. Relationship between (A) plant richness and invertebrate taxonomic richness, and (B) plant diversity and invertebrate morphospecies diversity in Carbondale, IL (SICE).

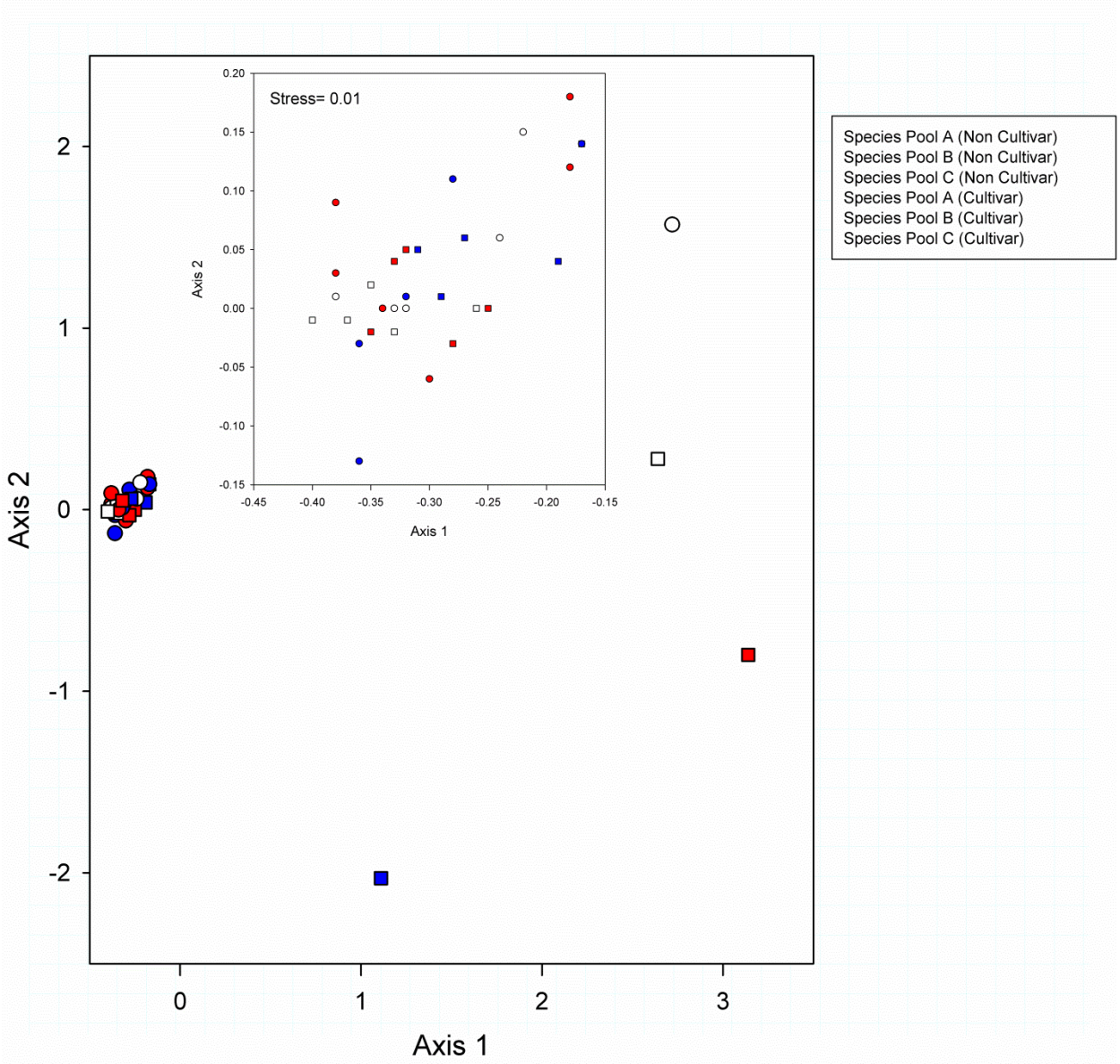

Figure 4.11. Two dimensional non-metric multidimensional scaling ordination of the invertebrate community in Carbondale, IL (SICE). Four subplots with divergent invertebrate communities were removed from the inset, and the remaining subplots displayed in the inset.

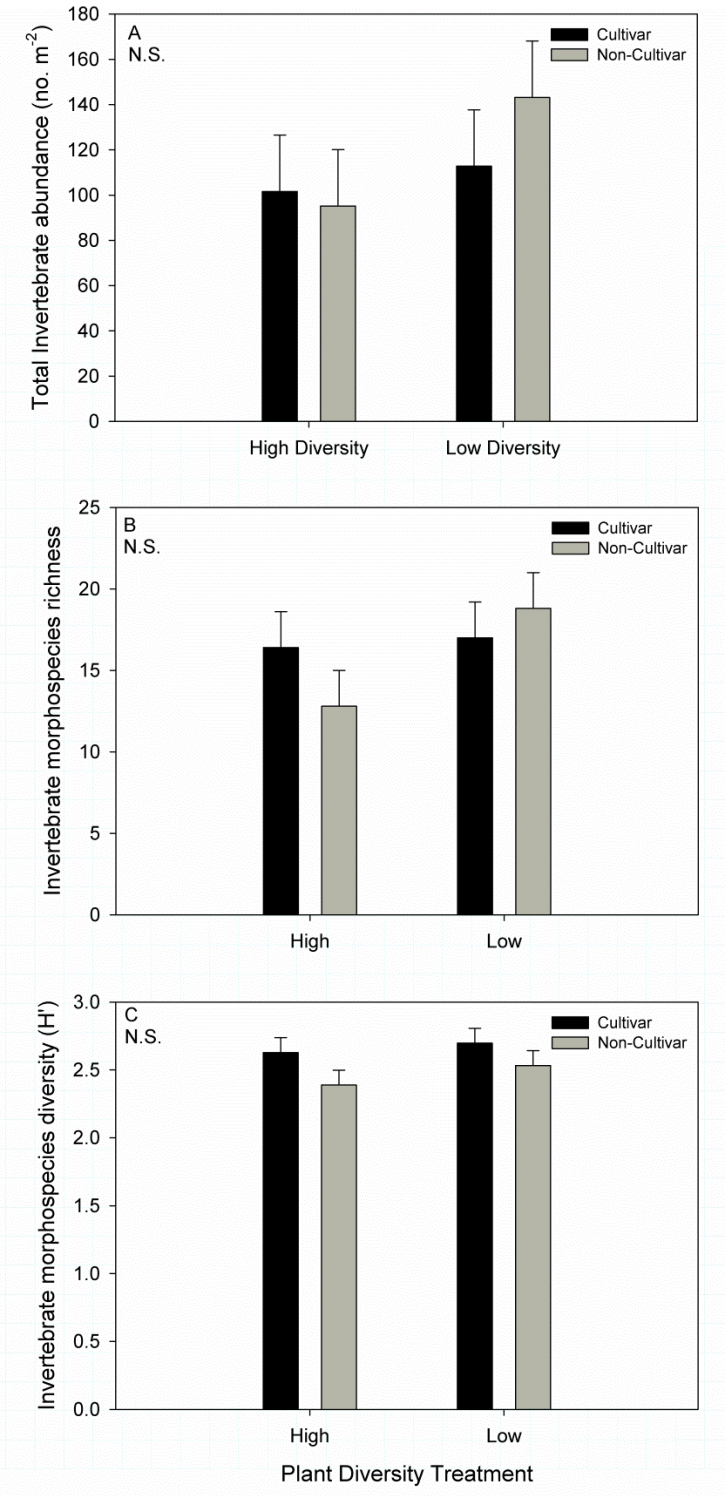

Figure 4.12. Mean (± SE) macroinvertebrate (A) total abundance, (B) morphospecies richness, and (C) morphospecies diversity in the dominant grass source and diversity treatments in Belleville, IL (BDE). Standard errors indicate within treatment variability.

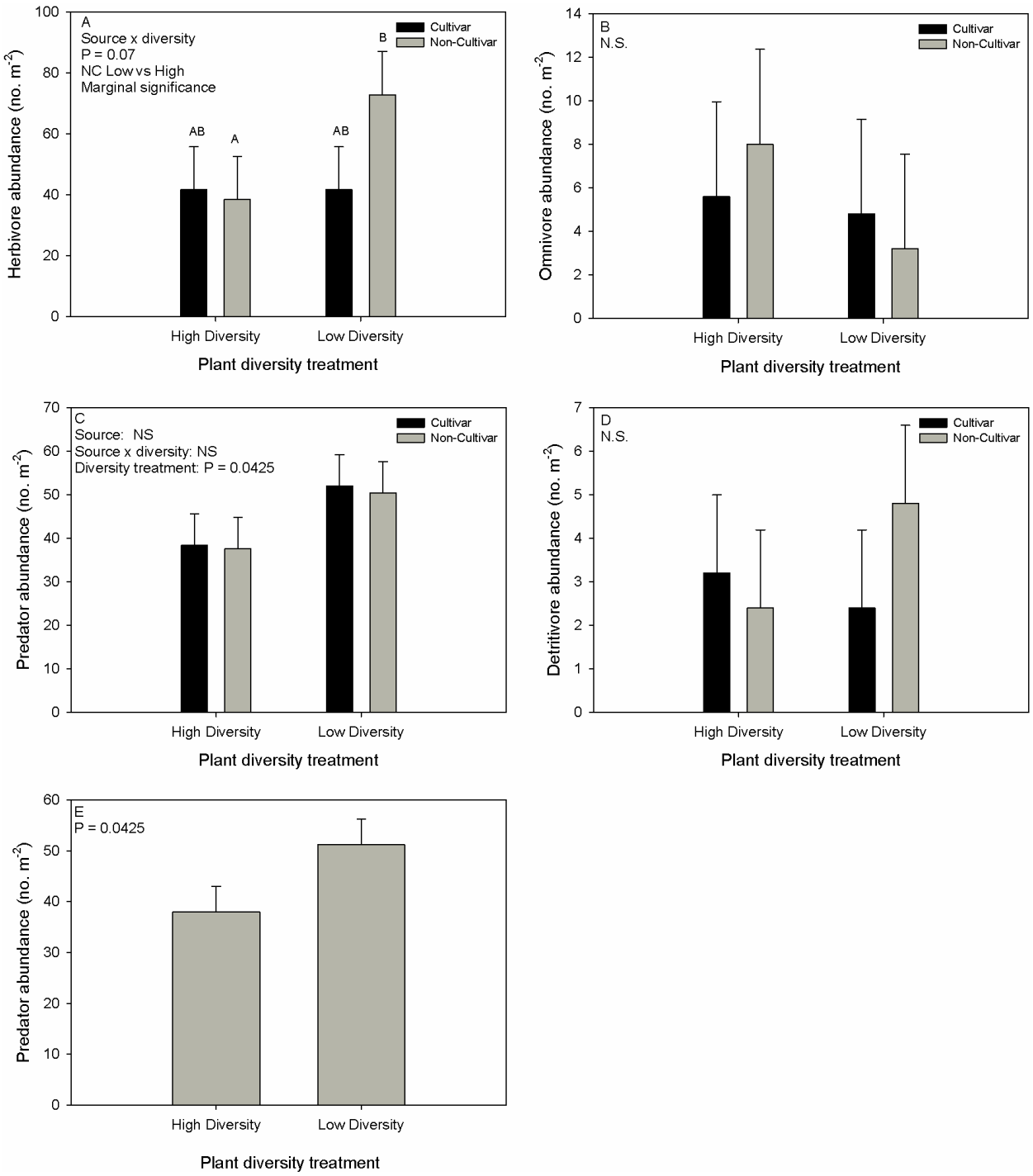

Figure 4.13. Mean (±SE) abundance of (A) herbivores, (B) omnivores, (C) predators, and (D) detritivores in the dominant grass source and diversity treatment combinations and (E) predator abundance in the diversity treatments averaged over dominant grass source in Belleville, IL (BDE). Standard errors indicate within treatment variability. Means accompanied by the same letter were not significantly different ($P > 0.05$).

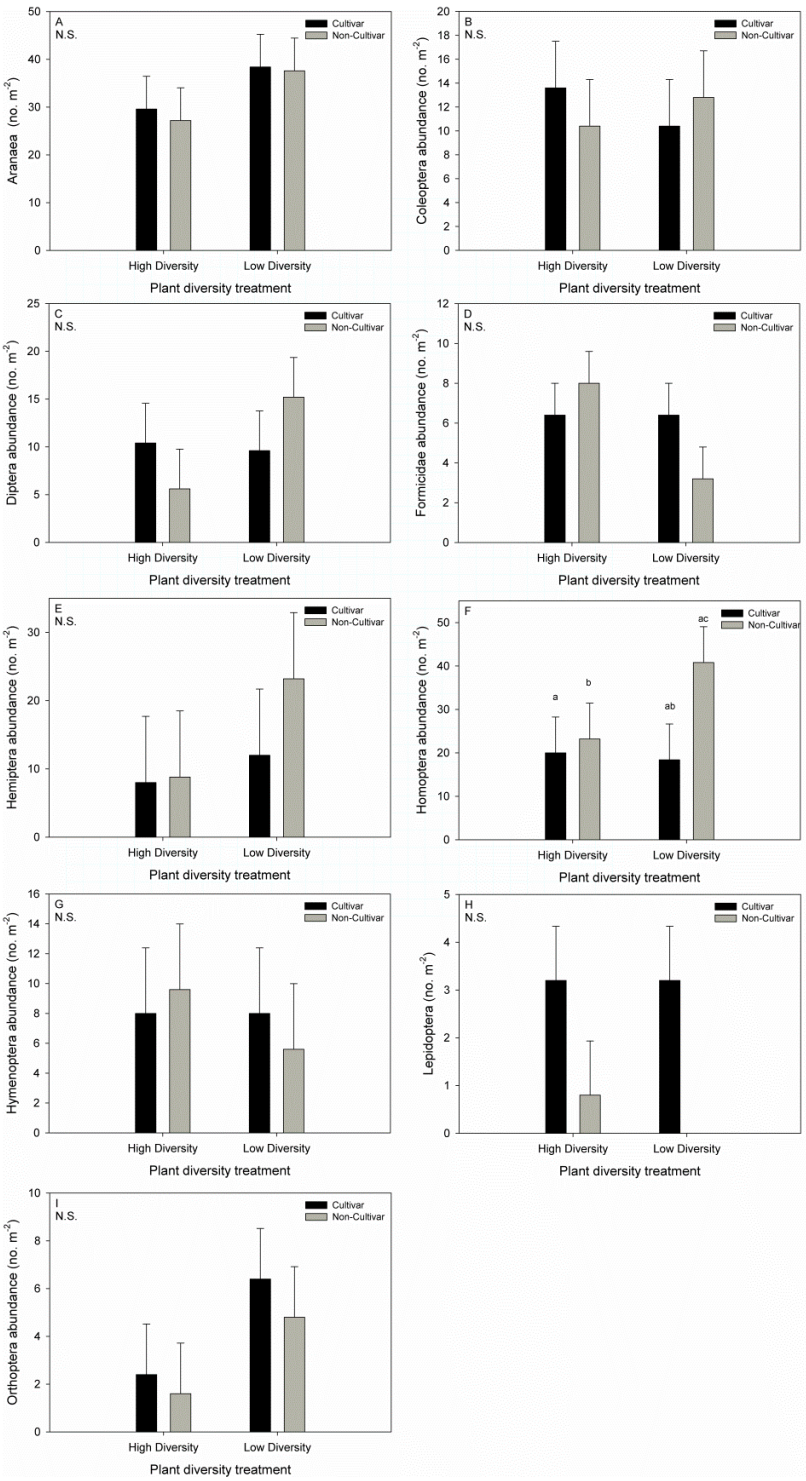

Figure 4.14.Mean (± SE) abundance of (A) Aranea, (B) Coleoptera, (C) Diptera, (D) Formicidae, (E) Hemiptera, (F) Homoptera, (G) Hymenoptera, (H) Lepidoptera, and (I) Orthoptera in diversity and dominant grass source treatment combinations in Belleville, IL (BDE). Means accompanied by the same letter were not significantly different ($P > 0.05$).

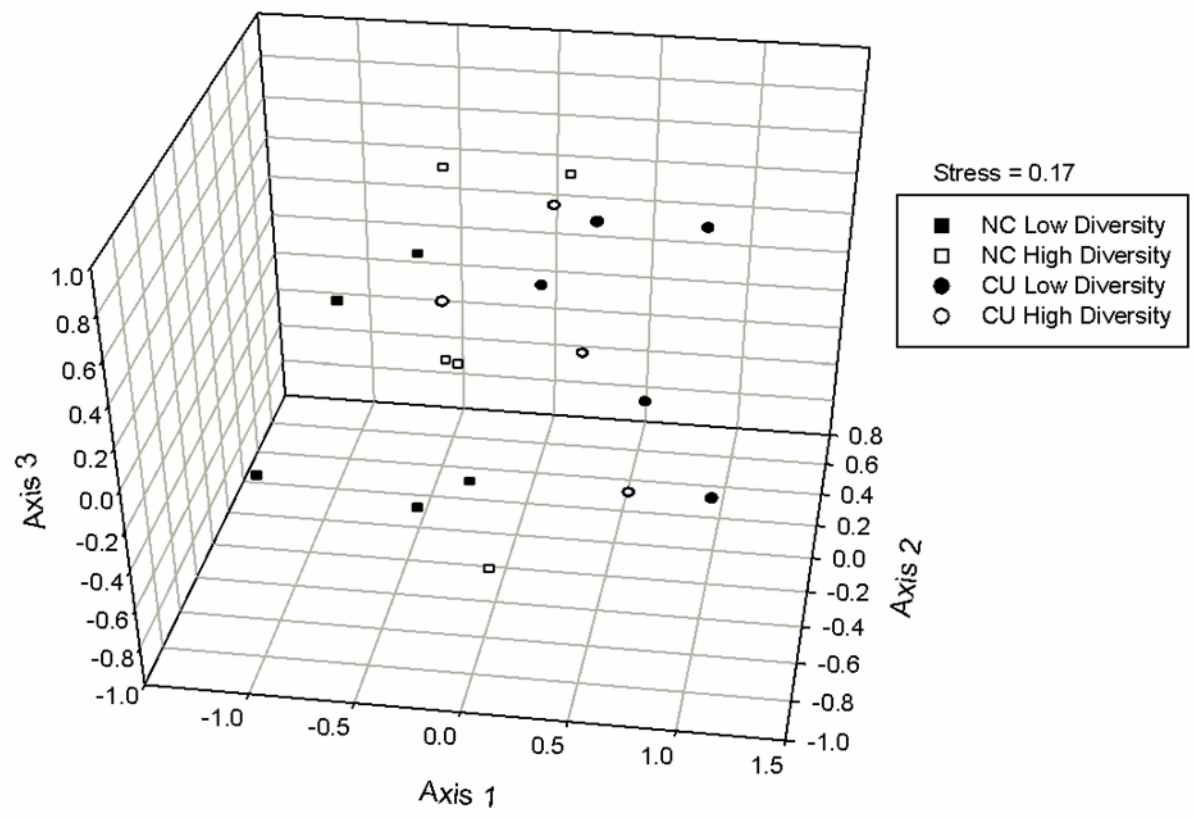

Figure 4.15.Three dimensional non-metric multidimensional scaling ordination of the invertebrate community in Belleville, IL (BDE).

CHAPTER 5

CONCLUSIONS

Invertebrates are linked to ecosystem structure, function, and successional pathways via herbivory, nutrient cycling, decomposition, and pollination. Invertebrates also serve as important links between different trophic levels. The purpose of this dissertation was to understand how aspects of the plant community (restoration time, dominant grass seed source, diversity, and plant composition) influenced the composition of macroinvertebrates in restored prairies.

In Chapter 2, the roles of time, plant community structure, and soil properties on the recovery of the abundance and biomass of ants and earthworms were examined. It was hypothesized that the recovery of ants and earthworms would be positively correlated with soil organic matter, aboveground productivity, litter, and root biomass. I found that restoring conventionally cultivated land to grasslands increases the abundance of ants and earthworms, which provision food for many wildlife species. Earthworms abundance increases linearly during prairie restoration to represent remnant prairie within two decades but earthworm taxa in restored and remnant prairie are most likely to be exotic in agricultural landscape of the U.S. Upper Midwest. Despite their origin, these ecosystem engineers are soil bioturbators, which likely has implications for soil properties and processes. Ant abundance and biomass were positively correlated with plant diversity. Thus, diverse restorations with a correspond high abundance of ants likely contain heterogenous soil and plant communities. Knowledge of the consequences of these no-analog conditions on the structure and function of restorations is

needed to understand the ecosystem services enhanced or compromised by exotic belowground engineers (Baer et al 2012).

In chapter three, the compositional changes of soil macroinvertebrates in a prairie restoration chronosequence were examined. The hypotheses for this study included that taxonomic richness, evenness and diversity of macroinvertebrates would increase across the chronosequence in response to developing systems and soil organic matter inputs (Matamala, et al. 2008; Baer et al. 2010). Additionally, it was hypothesized that different trophic groups would respond to the chronosequence idiosyncratically because detrivores and herbivores are likely more dependent on developing root systems than omnivores and predators. Finally, I hypothesized that macroinvertebrate community structure would be distinctly different between restored and remnant prairies.

I found total taxonomic richness (S), diversity (H′), and evenness (J′) did not change across the chronosequence. Cultivated fields contained few taxa, but showed high J′ and subsequently high H value relative to the restorations and remnants. There were no changes in higher taxonomic groupings, i.e., Hemiptera, Coleoptera (adults and larvae), Orthoptera, Diptera, Chilopoda, Diplopoda, or Isopoda. Taxonomic diversity (H’; based on morphospecies), richness, and evenness did not change across the chronosequence. Average taxonomic richness across all restorations was intermediate of cultivated fields and remnant prairie. Detritivores increased linearly across the chronosequence, while omnivores peaked at 5-8 years following restoration, coinciding with high plant richness. Spiders were the only groups of predators that increased across the chronosequence. Proportional similarity of the macroinvertebrate communities to the average structure of remnant prairies increased across the chronosequence, but this relationship was not upheld when individual remnant prairies with different community structures were used.

This study demonstrates that macroinvertebrates communities may change in a trajectory that is not representative of soil that has never been cultivated. Additionally, remnants can vary widely in macroinvertebrate trophic structure, diversity, taxonomic composition, and include exotic macroinvertebrate species indicating a real dilemma for assessing recovery of restoration to a "target" community. Additional research is needed to characterize the soil invertebrate communities of remnant prairies so target communities can be better identified. Experimental introduction s of soil invertebrates is also needed to determine if exotic soil invertebrates alter soil processes, and if these alterations are linked to successional changes.

Chapter 4 aimed to understand how intraspecific variation in dominant prairie grasses influence aboveground invertebrates community structure. Due to the fact that different plant communities are generally associated with different invertebrate communities (Wimp et al. 2005; Bangert et al. 2006), it was hypothesized that plant species composition would influence the composition of the invertebrate community. I also hypothesized that plant communities with higher density would support a greater number and diversity of invertebrates. Dominant grass source did not strongly affect macroinvertebrate morphospecies richness or Shannon's diversity, but one species pool had slightly higher Shannon's diversity than another. Macroinvertebrate trophic groups showed little response to source and species pool treatments. Herbivores exhibited a weak interaction between dominant grass source x species pool.

In this study of aboveground macroinvertebrates inhabiting experimental grasslands, I found little support for different sources of dominant grasses producing an 'extended phenotype' (Whitham et al 2003). If macroinvertebrates were responsive to intraspecific variation in traits of the dominant grasses, I expected to find differences in macroinvertebrate abundances, trophic levels, and/or communities due to variability in plant palatability, plant defenses, and tri-trophic

interactions (Whitham et al. 2003; Wimp et al. 2005; Johnson 2008). Appropriote propagule source is a hotly debated subject, but I found little evidence of seed source influencing terrestrial invertebrates at the morphospecies level. Additional research focusing on the effect of dominant grass source on grass specialists identified to the species level may provide additional guidance to restoration practitioners.

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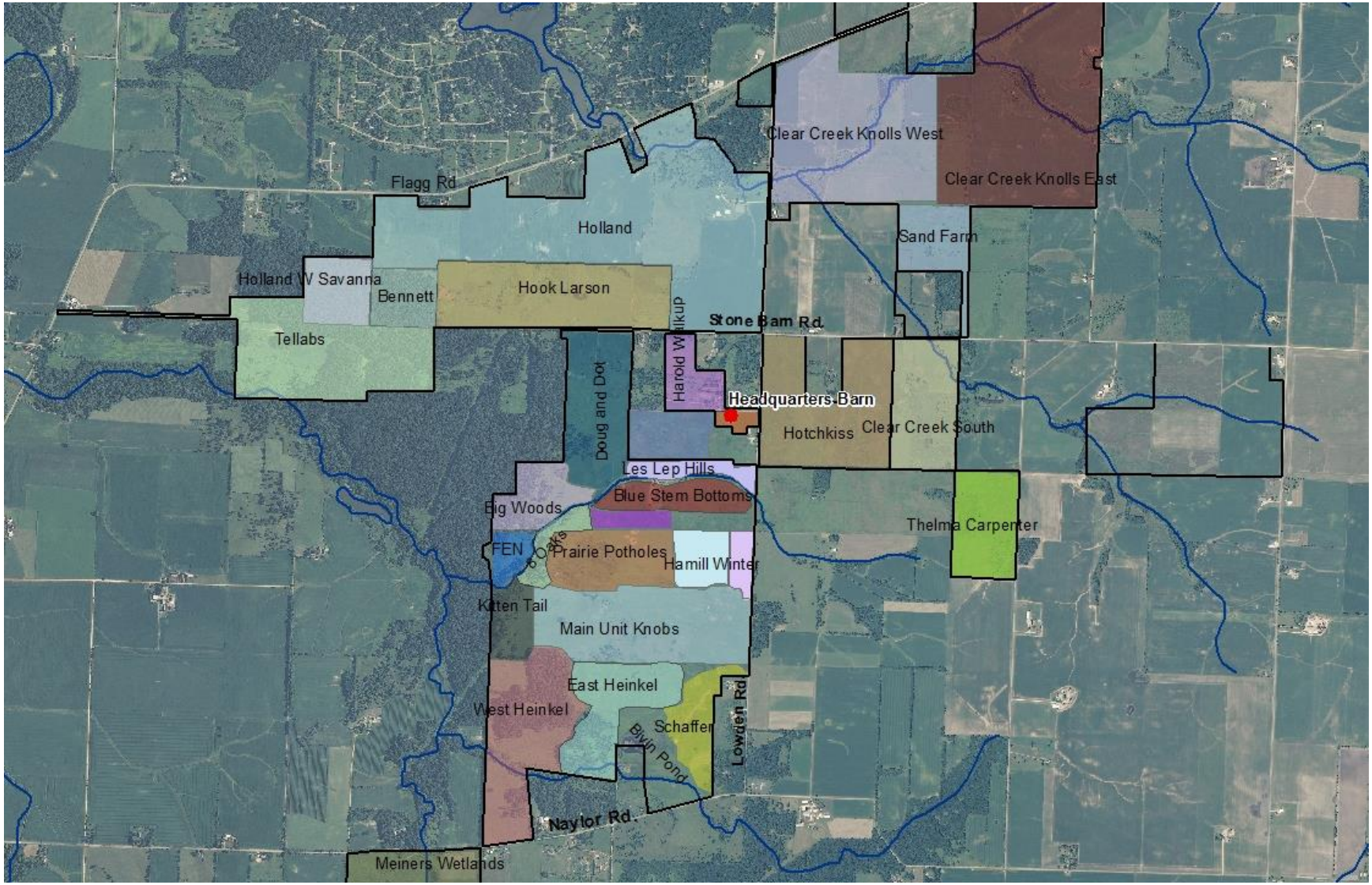
APPENDICES

Appendix A. Map of Nachusa remnant and restored prairies.



Appendix B. Prairie restoration sites identified by site number, and corresponding management units.

Site Number	Management Unit
TNC 74	Frank Creek NA; north half of field
TNC 69	Dot & Doug Wade Prairie- N of Potawatomi Ridge and Doug's knob
TNC 68	Clear Creek Knolls- Bernie & Jay's - West of Gobbler Ridge
TNC 66	Clear Creek Knolls- between planting 63 & Sand Farm
TNC 58	Naylor Rd- last of agricultural field
TNC 57	Thelma Carpenter- South West Field
TNC 56	Sand Farm Internal Fields
TNC 55	Headquarters Barn Field
TNC 53	Naylor road- Neck between trees and second planting of the agricultural field
TNC 52	NW corner of Hook Larson prairie
TNC 25	Triangle Field Planting (Hook Larson Prairie)
TNC 15	East Heinkel Planting
TNC 37	West Heinkel Planting
TNC 31	Entrance Planting / Coneflower Unit
TNC 13	Southwest Main Unit Planting
TNC 12	West Central Main Unit Planting
TNC 9	Prairie Potholes Planting
TNC 7	Bluestem Bottoms (Upper Planting)
Remnant 1	Thelma Carpenter
Remnant 2	Isabell's

Appendix C.Average ant abundance in each monolith from the two seasonal samples corresponding to their location (1-5) on the transect within each field at Nachusa Grasslands.

	Ant Larvae	***Lasius neoniger***	***Lasius claviger***	***Myrmica* spp.**	***Solenopsis molesta***	***Temnothorax* spp.**	***Ponera* spp.**	***Prenolepis* spp.**	***Paratrechina* spp.**	***Cremastogaster* spp.**	***Stenamma* spp.**	***Formica* spp.**	***Brachymyrmex* spp.**	***Aphaenogaster* spp.**	**Fragment**	**Unknown**
Holland																
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	6.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.0	2.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler																
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's																
1	2.0	15.0	0.0	0.5	62.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	2.5	0.0	0.0	0.5	0.0	0.0	0.0	21.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0

3	0.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00.	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.4	10.5	0.0	0.1	12.6	0.0	0.1	0.0	4.9	0.0	00.	0.1	0.0	0.0	0.0	0.0
Thelma Carpenter																
1	0.5	4.0	0.0	0.5	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2	0.5	1.5	0.0	1.5	0.0	1.5	3.0	0.0	32.5	0.0	0.0	0.0	12.0	1.5	0.0	0.5
3	0.0	25.0	0.0	0.5	0.0	0.5	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0
4	29.5	4.5	0.0	106.5	0.5	0.0	3.0	0.0	66.5	0.0	0.0	0.0	4.5	0.0	0.0	0.0
5	0.5	4.0	0.0	1.0	0.0	0.5	11.0	0.0	0.0	0.0	11.5	0.0	0.0	12.5	0.0	0.0
avg	6.2	7.8	0.0	22.0	0.1	0.5	4.1	0.0	19.9	0.0	2.4	0.0	3.3	2.9	0.0	0.1
TNC 74																
1	27	72.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	44.0	2.5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	15.0	47.5	0.0	0.0	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	8.4	32.8	0.5	0.0	1.6	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69																
1	0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	7.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.5	0.0	0.0	12.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.0	1.5	0.0	0.1	0.0	0.0	2.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68																

1	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0	0.0	0.0	3.5	0.0	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0	0.0	2.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0	0.0	0.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.0	0.1	0.0	0.5	0.7	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 65																
1	2.0	29.5	0.0	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	13.5	0.0	0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.0	47.5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	17	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.8	21.5	0.0	1.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58																
1	1	261.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2	176.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1	159.0	0.0	0.5	39.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	21.5	452.5	0.0	2.5	58.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	4.5	68.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	6	223.4	0.0	0.6	26.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57																
1	0.0	33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
3	0.0	270.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	8.0	352.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	92.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	1.6	166.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	

TNC 56

1	0.0	1.5	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	81.0	670.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	3.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.0	0.5	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	3.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	16.6	135.8	0.0	0.2	3.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 55

1	3.5	297.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	93.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6.5	195.0	0.0	1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	22.0	318.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.0	22.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	6.8	185.1	0.1	0.2	1.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 53

1	1.5	604.5	0.0	1.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.0	57.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	8.5	248.5	36.0	2.0	111.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	6.5	434.5	0.0	0.0	0.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.0	139	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	4.1	296.7	7.2	0.6	24.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 52

1	0.0	2.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	21.0	56.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	104.5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	4.2	32.6	0.0	0.1	1.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 37																
1	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	195.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	83.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	29.5	25.5	0.0	36.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
5	13.5	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	8.7	77.0	0.7	7.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
TNC 31																
1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3.5	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.5	0.5	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.7	17.2	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25																
1	43.5	110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	16.5	1.5	0.0	0.0	62.5	0.0	0.0	0.0	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	23.5	390.5	0.0	0.0	0.0	0.0	0.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4.5	58.5	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	23.0	39.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	17.6	116.7	7.9	0.0	13.3	0.0	0.1	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15																
1	3.5	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	94.0	86.0	0.0	0.0	100.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	2.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

avg	19.9	17.2	3.6	2.8	20.2	0.0	0.2	0.0	0.2	0.0	0.0	2.1	0.0	0.0	0.0	0.0
TNC 13																
1	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	2.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.2	0.3	0.4	0.5	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12																
1	61.5	369.0	0.0	0	58.5	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.5	767.5	0.0	0.5	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	32.0	0.0	0.5	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0	0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	12.8	233.9	0.0	0.2	11.7	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9																
1	4.5.0	157.0	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	12.5	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	116.0	16.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	6.0	242.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	66.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	2.1	118.7	12.8	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8																
1	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0
2	0.0	0.5	24.5	0.5	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	48.5	0.0	0.5	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.4	10	4.9	0.9	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0

Appendix D. Average earthworm abundance in each monolith from the two seasonal samples corresponding to their location (1-5) on the transect within each field at Nachusa Grasslands.

	Juvenile	***Aporrectodea trapezoides***	***Aporrectodea tuberculata***	***Lumbricus terrestris***	***Lumbricus rubellus***	***Lumbricus* spp**	***Bimastos longicinctus***	***Octolasion tyrtaeum***	**Fragment**	**Cocoons**
Cultivated										
Holland										
1	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
3	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0
5	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.5	0.5
avg	1.3	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.5	0.7
Gobbler										
1	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0
2	6.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	1.5
3	3.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	3.5	0.0	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
avg	2.8	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.5
Isabell's										
1	2.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.5
2	4.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
3	7	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
4	1.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.5	0.5
5	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
avg	3.5	0.0	0.8	0.0	0.0	0.0	0.0	0.0	1.2	0.4
Thelma Carpenter										
1	13.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	4.5	0.0
2	10.0	0.0	1.5	0.0	0.0	1.0	0.0	0.0	4.0	0.0
3	33.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	6.5	0.0
4	17.5	0.0	3.0	0.0	0.0	1.0	0.0	0.0	3.0	0.0
5	11.5	0.0	1.5	0.0	0.0	1.0	0.0	0.0	2.5	0.5
avg	17	0.0	1.5	0.0	0.0	0.7	0.0	0.0	4.1	0.1
TNC 74										
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

2	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	1.5
3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
4	5.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.0
avg	2.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.6	0.8
TNC 69										
1	3.5	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.5	0.0
2	13.0	0.0	0.5	0.0	0.0	1.0	0.0	0.0	2.0	0.0
3	15.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	2.0	0.5
4	9.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	1.0	0.0
5	18.0	0.0	0.5	0.0	0.0	2.0	0.0	0.0	4.5	0.0
avg	11.8	0.0	0.2	0.0	0.0	1.1	0.0	0.0	2.0	0.1
TNC 68										
1	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
2	3.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	1.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.8	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.2	0.3
TNC 66										
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 65										
1	5.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
4	2.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	2.3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.2
TNC 58										
1	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
2	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
3	5.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0
4	4.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	8.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
avg	4.3	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.8	0.3
TNC 57										
1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	2.0	0.5
3	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	4.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	11.0	2.0
avg	3.8	0.0	0.8	0.0	0.0	0.0	0.0	0.0	2.6	0.7
TNC 56										
1	4.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	1.0
3	7.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5
4	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5
5	4.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
avg	4.9	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4
TNC 55										
1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
3	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
4	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	5.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
TNC 53										
1	5.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0
2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
3	2.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.5	3.0
4	6.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	3.6	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.1	1.2
TNC 52										
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.5	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
3	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
4	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	1.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	1.5	0.1	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.3

TNC 37										
1	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.5
2	8.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	5.0	1.0
3	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
4	4.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0
5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
avg	4.7	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.3
TNC 31										
1	2.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
2	1.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	1.0	1.5
3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
4	2.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
avg	1.8	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.5	0.4
TNC 25										
1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
2	4.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	4.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
4	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
5	4.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.5	0.5
avg	4.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.3
TNC 15										
1	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
avg	0.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.3
TNC 13										
1	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0
3	7.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0
4	6.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5
5	10.5	0.0	2.0	0.0	0.0	0.0	0.0	0.5	2.5	1.0
avg	6.6	0.0	1.0	0.0	0.0	0.0	0.0	0.1	1.3	0.3
TNC 12										
1	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	5.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5

3	10.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0
4	1.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	3.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	2.0	0.0
avg	5.1	0.0	0.9	0.0	0.0	0.0	0.0	0.0	1.7	0.1
TNC 9										
1	10.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	4.0	0.5
2	6.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
3	9.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5
4	2.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	7.5	0.0	1.5	0.0	0.0	0.0	0.5	0.0	2.5	0.0
avg	7.0	0.0	1.9	0.0	0.0	0.0	0.1	0.0	1.6	0.2
TNC 8										
1	8.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0
2	7.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	3.5	1.0
3	10.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.5
4	6.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	5.0	1.0
5	4.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	1.0	0.5
avg	7.3	0.0	1	0.0	0.0	0.0	0.0	0.0	2.5	0.6

Appendix E. Length- to-mass (g ash-free dry mass [AFDM]) regressions for genera juveniles and fragments of earthworms recovered from Nachusa Grasslands.

Genera	n	r^2	*P*-value	Regression equation
Aporrectodea	30	0.80	<0.001	Ln(AFDM) = −6.053 + (0.815 * Ln(length))
Lumbricus	16	0.80	<0.001	Ln(AFDM) = −11.197 + (2.084 * Ln (length))
Juveniles	24	0.84	<0.001	Ln(AFDM) = −10.673 + (1.783 * Ln(length))
Fragments	25	0.77	<0.001	Ln(AFDM) = −10.357 + (1.854 * Ln(length))

Appendix F. Ash-free dry mass (AFDM) of ant species, genera, and larvae collected from the restoration chronosequence at Nachusa Grasslands.

Species or genus	Individual AFDM	No. Ashed
Aphaenogaster rudis-fulva	82.10	20
Brachymyrmex depilis	7.18	100
Formica spp.	134.19	16
Lasius claviger	38.31	10
Lasius neoniger	22.41	100
Lasius neoniger queen	816.40	10
Myrmica americana & *M. spatulata*	88.80	10
Paratrechina parvula	11.75	110
Ponera pennsylvanica	31.30	10
Prenolepis spp.	39.36	25
Solenopsis molesta	4.79	100
Solenopsis molesta (queen)	94.00	10
Stenamma spp.	15.00	2
Temnothorax ambiguus	6.69	35
Larvae	23.70	10

Appendix G: Average abundance in each monolith from the two seasonal samples corresponding to their location (1-5) on the transect within each field at Nachusa Grasslands.

	Juvenile	*Aporrectodea trapezoides*	*Aporrectodea tuberculata*	Cocoons	*Lumbricus terrestris*	*Lumbricus rubellus*	*Lumbricus* spp	*Bimastos* longicinctus	Octolasion tyrtaeum	Frag	Ant Larvae	*Lasius neoniger*
Holland												
1	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2	60.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
3	2.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	8.0
5	3.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
Gobbler												
1	2.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	12.0	0.0	0.0	3.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
3	6.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	7.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Isabell's												
1	5.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	30.0
2	9.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	5.0
3	14.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	68.0
4	3.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
5	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0
Thelma Carpenter												

1	13.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.5	4.0
2	10.0	0.0	1.5	0.0	0.0	0.0	1.0	0.0	0.0	4.0	0.5	1.5
3	33.0	0.0	1.0	0.0	0.0	0.0	0.5	0.0	0.0	6.5	0.0	25.0
4	17.5	0.0	3.0	0.0	0.0	0.0	1.0	0.0	0.0	3.0	29.5	4.5
5	11.5	0.0	1.5	0.5	0.0	0.0	1.0	0.0	0.0	2.5	0.5	4.0
TNC 74												
1	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	144.0
2	2.0	0.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	88.0
3	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	30.0	95.0
4	11.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
TNC 69												
1	7.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	1.0	0.0	1.0
2	26.0	0.0	1.0	0.0	0.0	0.0	2.0	0.0	0.0	4.0	0.0	0.0
3	31.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	4.0	0.0	14.0
4	18.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	2.0	0.0	0.0
5	36.0	0.0	1.0	0.0	0.0	0.0	2.0	0.0	0.0	9.0	0.0	0.0
TNC 68												
1	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	5.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	29.5
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.5	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	13.5
4	2.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.0	47.5
5	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0
TNC 58												
1	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	20.	522.0

2	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0	353.0
3	11.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	2.0	318.0
4	8.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0	905.0
5	16.0	0.0	8.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	136.0
TNC 57												
1	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0
2	15.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	166.0
3	4.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	540.0
4	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	705.0
5	8.0	0.0	5.0	4.0	0.0	0.0	0.0	0.0	0.0	22.0	0.0	185.0
TNC 56												
1	9.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
2	6.0	0.0	3.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	162.0	1341.0
3	15.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	6.0
4	10.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	4.0	1.0
5	9.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	7.0
TNC 55												
1	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	594.0
2	12.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	2.0	186.0
3	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	13.0	390.0
4	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	44.0	637.0
5	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	44.0
TNC 53												
1	10.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1209.0
2	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	57.0
3	5.0	0.0	4.0	6.0	0.0	0.0	0.0	0.0	0.0	1.0	17.0	497.0
4	12.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	869.0
5	5.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	278.0
TNC 52												
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
2	3.0	0.0	6.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0

3	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	42.0	112.0
4	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
5	2.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	209.0
TNC 37												
1	5.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	2.0	0.5	0.0
2	8.0	0.0	2.5	1.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	195.0
3	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	83.5
4	4.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	29.5	25.5
5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	13.5	81.0
TNC 31												
1	2.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5
2	1.0	0.0	2.5	1.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.5	85.0
4	2.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
TNC 25												
1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	87.0	220.0
2	9.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	3.0
3	9.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	47.0	781.0
4	12.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	9.0	117.0
5	9.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	46.0
TNC 15												
1	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0
2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	189.0	0.0
3	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
5	3.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0
TNC 13												
1	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.0	0.0
3	7.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0

4	6.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
5	10.5	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.5	2.5	0.0	1.5
TNC 12												
1	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.	61.5	369.0
2	5.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	2.5	767.5
3	10.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	32.0
4	1.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0
5	3.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
TNC 9												
1	10.0	0.0	4.0	0.5	0.0	0.0	0.0	0.0	0.0	4.0	4.5	157.0
2	6.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	12.5
3	9.0	0.0	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	116.0
4	2.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	242.0
5	7.5	0.0	1.5	0.0	0.0	0.0	0.0	0.5	0.0	2.5	0.0	66.0
TNC 8												
1	8.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.5	0.0
2	7.5	0.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.5
3	10.5	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	2.0	0.5	0.5
4	6.0	0.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0
5	4.0	0.0	2.5	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	48.5

	Lasius claviger	*Myrmica* spp.	*Solenopsis* molesta	*Temnothorax* spp.	*Ponera* spp.	*Prenolepis* spp.	*Paratrechina* spp.	*Cremastogaster* spp.	Unknown	*Stenamma* spp.	*Formica* spp.	*Brachymyrmex* spp.
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	1.0	125.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	1.0	0.0	0.0	0.0	42.0	0.0	0.0	0.0	1.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.5	0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.5	0	1.5	3.0	0.0	32.5	0.0	0.5	0.0	0.0	12.0
3	0.0	0.5	0	0.5	0.5	0.0	0.5	0.0	0.0	0.5	0.0	0.0
4	0.0	106.5	0.5	0.0	3.0	0.0	66.5	0.0	0.0	0.0	0.0	4.5.0

5	0.0	1.0	0.0	0.5	11.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	25.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	7.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	5.0	116.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	2.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	72.0	4.0	223.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												

1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	36.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.5	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	125.0	0.0	0.0	0.0	162.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	172.0	0.0	200.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
3	0.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	2.5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	58.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
3	16	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2	24.5	0.5	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.5	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Fragment	*Aphaenogaster* spp.	Mutilidae	Scarabaeidae larvae	Scarabaeidae adult 1	Scarabaeidae adult 2	Scarabaeidae adult 3	Scarabaeidae adult 4	Scarabaeidae adult 5	Geotrupidae adult	Trogidae	Ochodaeidae
Holland												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
3	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 74												
1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	4.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
TNC 66												
1	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	4.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	00.	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	1.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	3.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	4.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.5	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	00.	0.0

	Aphodiinae adult	Staphylinidae 1 adult	Staphylinidae 2 Adult	Staphylinidae Adult 3	Staphylinidae adult 4	Staphylinidae Adult 5	Staphylinidae Adult 6	Staphylinidae Adult 7	Staphylinidae Adult 8	Staphylinidae Larvae	Staphylinidae (Pselaphinae)	Elateridae Adult 1
Holland												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4	0.0	1.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5
TNC 74												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	2.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	1.0	1.5	0.0	0.0	0.0	1.5	0.5	0.0	0.0	0.0	0.0
2	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.5	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.5	0.0	3.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Elateridae Adult 2	Elateridae (Larvae 1)	Elateridae (Larvae 2)	Elateridae Larvae 3	Elateridae Larvae 4	Elateridae Larvae 5	Elateridae Larvae 6	Elateridae Larvae 7	Meloidae larvae	Cantharidae Larvae	Lampyridae	*Colliuris pennsylvanica*
Holland												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5
5	0.0	0.5	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	5.5	0.0	0.5	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0..0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	8.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	15.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	00.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 8												
1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Charidotella sexpunctata	*Cicendelidae* spp. adult	*Cicendelidae* spp. larvae	Carabidae larvae	*Pterostichus* spp.	*Calleida punctata*	*Tachys* spp.	*Dyschirius* spp.	*Trichocellus* spp.	*Trechus* spp.	*Stenolophus* spp.	*Selenophorus* spp.
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
2	0.0	0.0	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	3.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
TNC 69												
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
2	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	2.0	3.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0

4	0.0	0.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Poecilus spp.	*Harpalellus* spp.	*Amara* spp.	*Harpalus* spp.	*Pseudoamara* spp.	*Anisodactyles* spp.	*Zuphium* spp.	*Plochionus* spp.	Unknown Carabidae Adult	Adult Carabidae Fragment	Lucanidae adult	Lucanidae Larvae
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
5	0.0	0.0	0.0	0.5	0.5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Tenebrionidae larvae	unknown grub	beetle larvae frag	Chrysomelidae	Scaphidiidae	Curculionidae Larvae	Unknown beetle larvae	Unknown beetle adult	Beetle Fragment	Coccinelidae adult	Lamiinae	Cerambycidae
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	1.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.5	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0

	Lepturininae	Dignathodontidae	lithobiidae	Henicopidae	Henicopidae	Julidae	Oniscus	Opiliones	Salticidae	Lycosidae	Lycosidea (Pirata)	Linyphiidae
Holland												
1	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	2.5	0.5	0.0	4.0	0.0	0.0	0.0	0.5	0.0	0.0
2	0.0	0.0	0.5	0.0	0.0	5.0	1.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	.02	0.0	0.0	2.5	1.0	0.0	0.0	0.5	0.0	1.0

4	0.0	0.0	2.5	0.0	0.0	1.5	1.0	0.0	0.0	0.0	1.5	0.0
5	0.0	0.0	1.5	0.0	0.0	4.0	0.5	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	2.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	1.0	0.0	0.0
2	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	2.0
3	0.0	0.0	0.0	1.0	0.0	2.0	1.0	0.0	0.0	0.0	1.0	1.0
4	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0

5	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0	0.0	0.0	0.0
TNC 57												
1	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	1	0.0	1.0
4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
TNC 52												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
5	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0
2	0.0	0.0	0.5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.5	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0	0.0	0.0	0.0	1.0
5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0

TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
5	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	1.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0
2	0.0	0.0	0.5	0.5	0.0	0.0	1.5	0.0	0.0	0.5	0.0	0.0
3	0.0	0.0	0.5	0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	3.0	0	0.0	0.5	1.5	0.0	0.0	0.0	0.0	0.5
5	0.0	0.0	0.5	0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.5

	Linyphiidae (yellow legs)	Linyphiidae (Stiped)	Clubionidae	Thomisidae (Xysticus)	Corinnidae (Castianeirina)	Corinnidae (Trachelinae)	Mysmenidae	Misumenoides	Liocranidae	Zoridae	Araneidae	Gnaphosidae
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.5	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												

1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0

	Aranaeida (Eustala)	Tetragnathidae (Pachygnatha)	Philodromidae (Tibellus)	Spider fragment	Enicocephalidae	Reduviidae Emesinae	Reduviidae	Coreidae	Pentatomidae	Aphidae	Geocoridae	Aradidae
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Alydidae nymph	Anthocoridae adult	Anthocoridae nymph	Lygaeidae adult	Lygaeidae nymph	Rhyparochromidae	Fulgoridae numph	Narrow Homopteran Nymph	Ciccadellidae	Cicadellidae (Striped adult)	Cicadellidae nymph	Miridae
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.5	1.5	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.	0.0	0.0	0.5	0.0	0.0
TNC 58												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	1.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	.00	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Nabidae Larvae	Unkown Nymph	Fragment	Eucharitidae	Pyralidae 1	Lepidoptera 2	Lepidoptera 3	Lepidoptera 4	Lepidoptera 5	Lepidoptera 6	Lepidoptera 7	Lepidoptera 8
Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
TNC 66												
1	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.5	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	2.0	1.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Unknown Lepidoptera	Adult moth	Plutelliidae (adult)	Hymenoptera adult (blk w/lg stinger)	Diptera adult 1	Diptera adult 2	Bibionidae larvae	Unknown diptera larvae	Culicidae	Orthoptera adult 1	Orthoptera adult 2	Orthoptera numph 3
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Holland												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's												
1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69												

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56												
1	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0	0.0	29.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0
TNC 52												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 37												
1	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15												
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8												
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Orthoptera Nymph 1	Orthoptera nymph 2	Orthoptera nymph 3	Orthoptera nymph 4	Orthoptera nymph 5	Unknown larvae
Holland						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	1.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
Gobbler						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
Isabell's						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
Thelma Carpenter						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.5	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 74						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 69						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 68						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 66						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 58						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0

5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 57						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 56						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 55						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 53						
1	0.0	0.0	0.0	2.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 52						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0

TNC 37						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 31						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 25						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 15						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 13						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 12						

1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 9						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
TNC 8						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0

Appendix H. Trophic designations of macroinvertebrate morphospecies at Nachusa Grasslands. Letters A, J, N, and F indicate adult, juvenile, nymph, and fragment, respectively. Taxa that could not be identified past the preceding taxonomic level within each column of the table indicated by UNK for "unknown." The number of morphospecies in each group indicated in parentheses.

Detritivores	**Herbivores**	**Predators**	**Omnivores**
Haplotaxida	**Diplopoda**	**Hymenoptera**	**Hymenoptera**
Lumbricidae	Julidae	Formicidae	Formicidae
Aporrectodea trapezoides	**Coleoptera**	*Myrmica* spp.	UNK (1L)
Aporrectodea tuberculata	Lamiinae (1A)	*Ponera* spp.	*Lasius neoniger*
Lumbricus terrestris	Cerambycidae (1A)	*Stenamma* spp.	*Lasius claviger*
Lumbricus rubellus	Lepturininae (1A)	Mutillidae (1A)	*Solenopsis molesta*
Lumbricus spp. (J)	Chrysomelidae (1A)	Eucharitidae (1A)	*Temnothorax* spp.
Bimastos longicinctus	Scaphidiidae (1A)	**Coleoptera**	*Prenolepis* spp.
Octolasion tyrtaeum	Curculionidae (1A)	Meloidae (1L)	*Paratrechina* spp.
UNK (1J, 1F)	Tenebrionidae (1L)	Lampyridae (1A)	*Crematogaster* spp.
Isopoda	**Hemiptera**	Cicindelinae	*Aphaenogaster* spp.
Oniscidae	Coreidae (1A)	*Charidotella sexpunctata*	*Formica* spp.
Oniscus spp.	Pentatomidae (1A)	UNK (1A, 1L)	*Brachymyrmex* spp.
Coleoptera	Aphididae (1A)	Carabidae	**Coleoptera**
UNK (L)	Aradidae (1A)	*Pterostichus spp*.	Staphylinidae (8A, 1L)
Scarabaeidae (5A, 1L)	Alydidae (1N)	*Calleida punctata*	Cantharidae (1L)
Aphodiinae (1A)	Lygaeidae (1A, 1N)	*Tachys* spp.	
Geotrupidae (1A)	Rhyparochromidae (1A)	*Dyschirius* spp.	
Trogidae (1A)	Fulgoridae (2N)	*Trichocellus* spp.	
Ochodaeidae (1A)	Cicadellidae (1A, 1N)	*Trechus* spp.	
Staphylinidae	Miridae (1A)	*Stenolophus* spp.	
Pselaphinae (1A)	**Diptera**	*Selenophorus* spp.	
Elateridae (2A, 7L)	UNK (2A, 1L)	*Poecilus* spp.	
Lucanidae (1A, 1L)	Bibionidae (1L)	*Harpalellus* spp.	

	Lepidoptera Pyralidae (1A, 9L) Plutellidae (1A) **Orthoptera** (2A, 5N)	*Amara* spp. *Harpalus* spp. *Pseudoamara* spp. *Anisodactyles* spp. *Zuphium* spp. *Plochionus* spp. UNK (1L, 1A, 1F) Coccinellidae (1A) **Geophilomorpha** Dignathodontidae **Lithobiomorpha** Lithobiidae Henicopidae **Opiliones** Phalangiidae (1A) **Araneae** UNK (1F) Salticidae Lycosidae UNK (1) *Pirata* spp. Linyphiidae (UNK 1-3) Clubionidae Thomisidae *Xysticus* spp. *Misumenoides* spp. Corinnidae *Castianeira* spp. *Trachelinae* spp. Mysmenidae Liocranidae Zoridae Araneidae UNK 1 *Eustala* spp. Gnaphosidae	

		Tetragnathidae *Pachygnatha* spp. Philodromidae *Tibellus* spp. **Hemiptera** Enicocephalidae (1A) Reduviidae Emesinae (1A) Geocoridae Anthocoridae (1A, 1N) Nabidae (1N) **Diptera** Culicidae (1A)	

Appendix I. Invertebrate abudance from each plot (1-12) and sublplot (1-3) sampled in Carbondale IL (SICE).

	Gnaphosidae (*Sergiolus* spp.)	Gnaphosidae 2	Clubionidae (*Clubiona* spp.)	Clubionidae 3	Lycosidae 1	Lycosidae (*Pirata* spp.)	Salticidae 1	Salticidae 3	Salticidae 4	Salticidae 7	Salticidae 8	Salticidae 9
SICE1_1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	1.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0

SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE9_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE10_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
SICE11_3	0.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0

	Salticidae 10	Salticidae (*Marpissa* spp.)	Araneidae (*Lariana* spp.)	Araneida (*Acanthepeira* spp.)	Araneida (Argiope spp.)	Philodromidae (*Philodromus* spp.)	Linyphiidae 1	Amaurobiidae	Thomisidae (*Misumenoides* spp.)	Thomisidae (*Xysticus* spp.)	Miturgidae	Philodromidae (*Tibellus* spp.)
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	1.0	0.0	1.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE7_3	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE8_1	0.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Mimetidae	Opiliones	Chrysopidaetera	Curculionidae 3	Curculionidae 4	Curculionidae 5	Curculionidae 6	Curculionidae 7	Tachys 2	Staphylinidae 2	Cantharidae (Chauliognathes)	Unknown beetle (3)
SICE1_1	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0

SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0

	Tipulidae	Sphaeroceridae	Sphaeroceridae 2	Muscidae 1	Muscidae 2	Phoridae	Cecidomyiidae	Unknown fly 1	Unknown fly 3	Oniscidea	Cicadellinae 1	Cicadellidae 1
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE1_2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE2_1	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE2_2	0.0	1.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE2_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	2.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
SICE12_1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE12_2	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0

	Cicadellidae 2	Cicadellidae 3	Cicadellidae 4	Cicadellidae 5	Cercopidae 1	Cercopidae 2	Nymph 1	Membracidae 1	Membracidae 2	Delphacidea 1	Delphacidae nymph	Nymph 3
SICE1_1	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE2_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0

SICE9_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Nymph 4	Nymph 5	Unknown Homopteran larvae (Spiny)	Formica pallidefulva	*Formica incerta*	*Crematogaster* spp.	*Tetramorium* spp.	Mutillidae	Chalcidae 1	Chalcidae 2	Chalcidae 3	Scelionidae
SICE1_1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00.	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0

	Dryinidae	Brachionidae 3	Syrphidae 3	Acrididae (Melanoplinae)	Acrididae (Melanoplinae 2)	Acrididae (Melanoplinae 3)	Gryllidae (Nemobiinae)	Tettigonidae (Phaneropterinae)	Gryllidae (Gryllinae)	Orthopteran Nymph	*Oncopeltus fasciatus*	Emesinae
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	1.0	5.0	0.0	2.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	1.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	0.0	1.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0

	Berytidae	Coreidae 1	Reduviidae (Stenopodainae)	Lygaeidae nymph	Phymatidae	Euschistus	Phlaeothripidae	Hemipteran nymph2	Hemipteran Nymph 3	Coccoidea	*Oebalus pugnax*	Alydidae (Alydus)
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0

	Unknown Hemiptera (3)	Pentatomidae Nymph	Caterpillar 1	Caterpillar 2	Pyrallidae 1	Mantodae
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	1.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	1.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	1.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	1.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	1.0
SICE6_2	0.0	0.0	0.0	0.0	1.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	1.0	0.0	0.0	0.0	1.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0

SICE9_2	0.0	0.0	0.0	0.0	1.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	2.0	0.0
SICE10_1	0.0	0.0	0.0	1.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	1.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	1.0	0.0
SICE12_3	0.0	0.0	0.0	0.0	3.0	0.0

Appendix J. Plant cover data (%) from ech plot (1-12) and subplot (1-3) sampled in Carbondale, Illinois (SICE).

	Andropogon gerardii	*Sorgastrum nutans*	*Schizachyrium scoparium*	*Agrostis hyemalis*	*Elymus Canadensis*	*Asclepias verticellata*	*Aster oblong*	*Baptisia leucantha*
SICE1_1	25.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
SICE1_2	0.0	10.0	0.0	0.0	5.0	0.0	0.0	0.0
SICE1_3	20.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0
SICE2_1	30.0	20.0	0.0	0.0	35.0	0.0	0.0	20.0
SICE2_2	25.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	20.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	10.0	50.0	0.0	0.0	20.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	15.0	5.0	0.0	0.0	0.0
SICE4_1	25.0	25.0	0.0	0.0	5.0	0.0	0.0	70.0
SICE4_2	15.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	15.0	35.0	0.0	8.0	0.0	0.0	0.0	0.0
SICE5_1	10.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	15.0	40.0	0.0	0.0	0.0	0.0	0.0	50.0
SICE5_3	25.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	15.0	15.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	10.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0
SICE6_3	15.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	30.0	40.0	10.0	0.0	0.0	0.0	0.0	5.0
SICE7_2	10.0	60.0	0.0	0.0	0.0	0.0	2.0	5.0
SICE7_3	25.0	60.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	5.0	15.0	50.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	42.0	42.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	20.0	65.0	0.0	0.0	0.0	1.0	0.0	90.0
SICE9_1	25.0	15.0	3.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	65.0	15.0	2.0	0.0	0.0	0.0	0.0	0.0

SICE9_3	25.0	7.0	0.0	0.0	5.0	0.0	0.0	90.0
SICE10_1	20.0	20.0	50.0	0.0	0.0	0.0	0.0	0.0
SICE10_2	15.0	25.0	0.0	0.0	0.0	0.0	0.0	30.0
SICE10_3	35.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	65.0	15.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	20.0	40.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	25.0	20.0	15.0	0.0	0.0	0.0	0.0	90.0
SICE12_1	35.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	45.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	40.0	45.0	0.0	0.0	0.0	1.0	0.0	13.0

	Cassia fasciculata	*Ratibida pinnata*	*Achillea millefolium*	*Desmanthus illinois*	*Desmodium Illinoense*	*Echinaceae purpurea*	*Koeleria cristata*	*Liatris pycnostachia*
SICE1_1	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	20.0	0.0	0.0	8.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	10.0	30.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	5.0	0.0	10.0	0.0
SICE5_2	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE6_2	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	8.0	0.0	10.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	16.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	60.0	6.0	0.0	2.0	4.0
SICE8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	9.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	65.0	0.0	6.0	2.0	0.0
SICE9_3	28.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
SICE10_2	50.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	75.0	3.0	2.0	3.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	50.0	1.0	1.0	0.0	0.0
SICE11_3	65.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	60.0	4.0	3.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
SICE12_3	30.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0

	Ruellia humilis	*Silphium integrifolium*	*Solidago rigida*	*Aster asurea*	*Baptisia leucophea*	*Heliopsis helianthoides*	*Monarda fistulosa*	*Panicum virgatum*
SICE1_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_2	2.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0

SICE2_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	4.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0	20.0	20.0	5.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	5.0	0.0	15.0	0.0
SICE5_1	0.0	30.0	13.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0	5.0	0.0	10.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	2.0	10.0	5.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	30.0	0.0	0.0	6.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	10.0	0.0	0.0	25.0	0.0	0.0	0.0
SICE9_2	2.0	30.0	2.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
SICE10_1	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	3.0	10.0	3.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0
SICE11_2	4.0	40.0	7.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	5.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	1.0	0.0	0.0	2.0	0.0	3.0	7.0

SICE12_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Penstemon digitalis	*Petalostemon purpurea*	*Rudbeckia hirta*	*Silphium lacinatum*	*Ambrosia artemesia*	*Helianthus mollis*	*Conyza canadensis*	*Oxalis stricta*
SICE1_1	0.0	0.0	5.0	0.0	3.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	10.0	0.0	35.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	5.0	0.0	4.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	20.0	0.0	0.0	3.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	250.	5.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	20.0	0.0	0.0	20.0	0.0	0.0
SICE6_1	0.0	10.0	10.0	13.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	3.0	0.0	1.0	10.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	5.0	0.0	2.0	10.0	0.0	0.0	0.0	0.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	3.0	14.0	0.0	0.0	0.0	0.0
SICE10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	2.0	0.0	5.0	7.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	2.0	8.0	0.0	0.0	0.0	1.0
SICE12_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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	Solidago canadensis	*Trifolium repens*	*Aster ericoides*	*Juncus spp*	*Circium discolor*	*Erygium yuccafolium*	*Desmodium spp*	*Helianthus spp*
SICE1_1	10.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE1_2	10.0	0.0	13	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE2_2	30.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE2_3	40.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE3_1	12.0	0.0	0	0.0	0.0	0.0	0.0	0.0
SICE3_2	20.0	0.0	15	2.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	20	0.0	25.0	0.0	0.0	0.0
SICE4_1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
SICE4_2	25.0	0.0	0.0	2.0	0.0	5.0	0.0	0.0
SICE4_3	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0
SICE5_2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE5_3	3.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0

SICE6_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_2	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE6_3	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SICE7_2	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
SICE8_1	5.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE8_2	3.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
SICE8_3	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SICE9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_1	4.0	0.0	0.0	2.0	0.0	0.0	0.0	3.0
SICE10_2	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE10_3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
SICE11_3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SICE12_3	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0

	Unknown Forb 1	*Unknown forb 2*	*Unknown grass 1*	*Aster spp*	Lespedeza spp
SICE1_1	0.0	0.0	0.0	0.0	0.0
SICE1_2	0.0	0.0	0.0	0.0	0.0
SICE1_3	0.0	0.0	0.0	0.0	0.0
SICE2_1	0.0	0.0	0.0	0.0	0.0

SICE2_2	0.0	0.0	0.0	0.0	0.0
SICE2_3	0.0	0.0	0.0	0.0	0.0
SICE3_1	0.0	0.0	0.0	0.0	0.0
SICE3_2	0.0	0.0	0.0	0.0	0.0
SICE3_3	0.0	0.0	0.0	0.0	0.0
SICE4_1	0.0	0.0	0.0	0.0	0.0
SICE4_2	0.0	0.0	0.0	0.0	0.0
SICE4_3	0.0	0.0	0.0	0.0	0.0
SICE5_1	0.0	0.0	0.0	0.0	0.0
SICE5_2	0.0	0.0	0.0	0.0	0.0
SICE5_3	0.0	0.0	0.0	0.0	0.0
SICE6_1	0.0	0.0	0.0	0.0	0.0
SICE6_2	0.0	0.0	0.0	0.0	0.0
SICE6_3	0.0	0.0	0.0	0.0	0.0
SICE7_1	0.0	0.0	0.0	0.0	0.0
SICE7_2	0.0	0.0	0.0	0.0	0.0
SICE7_3	0.0	0.0	0.0	0.0	0.0
SICE8_1	0.0	0.0	0.0	0.0	0.0
SICE8_2	0.0	0.0	0.0	0.0	0.0
SICE8_3	0.0	0.0	0.0	0.0	0.0
SICE9_1	1.0	1.0	0.0	3.0	0.0
SICE9_2	0.0	0.0	2.0	0.0	0.0
SICE9_3	0.0	0.0	0.0	0.0	0.0
SICE10_1	0.0	0.0	0.0	0.0	1.0
SICE10_2	0.0	0.0	0.0	0.0	0.0
SICE10_3	0.0	0.0	0.0	0.0	0.0
SICE11_1	0.0	0.0	0.0	0.0	0.0
SICE11_2	0.0	0.0	0.0	0.0	0.0
SICE11_3	0.0	0.0	0.0	0.0	0.0
SICE12_1	0.0	0.0	0.0	0.0	0.0

SICE12_2	1.0	3.0	0.0	2.0	0.0
SICE12_3	0.0	0.0	0.0	0.0	0.0

Appendix K. Summary of treatment effects (F values with degrees of freedom as subscripts) for main effect of dominant grass [S= source (CU= cultivar, NC= Non cultivar)] and species pool (SP= species pool) and their interaction on invertebrate abundances from Carbondale, IL (SICE).

		Total Invertebrate Abundance	Diversity (H')	Richness	Predator Density	Omnivore Density	Herbivore Density	Detritivore Density	Aranea Density	Orthoptera Density
Source	CU vs NC	$0.02_{1,10}$	$0.01_{1,10}$	$0.08_{1,10}$	$0.0_{1,10}$	$2.05_{1,10}$	$0.1_{1,10}$	$0.19_{1,10}$	$0.03_{1,10}$	$2.53_{1,10}$
Species Pool	A vs. B	$1.60_{,1,20}$	$2.33_{1,20}$	$2.01_{1,20}$	$0.25_{1,20}$	$1.38_{1,20}$	$1.57_{1,20}$	$0.09_{1,20}$	$0.05_{1,20}$	**$5.05_{1,29}$***
	A vs. C	$0.40_{1,20}$	$3.26_{1,20}$	$1.13_{1,20}$	$0.17_{1,20}$	$0.61_{1,20}$	$0.50_{1,20}$	$0.0_{1,20}$	$0.0_{1,20}$	**$10.87_{2,20}$****
	B vs. C	$0.40_{1,20}$	$0.08_{1,20}$	$0.13_{1,20}$	$0.01_{1,20}$	**$3.83_{1,20}$**	$0.30_{1,20}$	$0.09_{1,20}$	$0.05_{1,20}$	$1.10_{1,20}$
Species Pool X Source	A: CU vs. NC	$0.42_{1,26.9}$	$0.0_{1,20.6}$	$0.04_{1,24.7}$	$1.29_{1,28.4}$	$2.18_{1,27.6}$	$2.19_{1,28.5}$	$0.08_{1,17.9}$	$1.48_{1,28.6}$	**$6.47_{1,29}$***
	B: CU vs. NC	$0.0_{1,26.9}$	$0.0_{1,20.6}$	$0.0_{1,24.7}$	$1.29_{1,28.4}$	$0.97_{1,27.6}$	$0.08_{1,28.5}$	$0.0_{1,17.9}$	$2,31_{1,28.6}$	$0.04_{1,29}$
	C: CU vs. NC	$0.15_{1,26.9}$	$0.06_{1,20.6}$	$0.12_{1,24.7}$	$0.01_{1,28.4}$	$0.24_{1,27.6}$	$0.32_{1,28.5}$	$0.70_{1,17.9}$	$0.0_{1,28.6}$	$0.0_{1,29}$
	CU: A vs. B	$1.55_{1,20}$	$1.25_{1,20}$	$1.18_{1,20}$	$0.68_{1,20}$	$0.31_{1,20}$	$3.42_{1,20}$	$0.19_{1,20}$	$2.42_{1,20}$	**$7.59_{1,29}$ ***
	CU: A vs. C	$1.09_{1,20}$	$1.29_{1,20}$	$0.45_{1,20}$	$0.06_{1,20}$	$1.22_{1,20}$	$2.62_{1,20}$	$0.19_{1,20}$	$0.39_{1,20}$	**$12.98_{1,29}$ ***
	CU: B vs. C	$0.04_{1,20}$	$0.0_{1,20}$	$0.17_{1,20}$	$0.35_{1,20}$	$2.75_{1,20}$	$0.05_{1,20}$	$0.75_{1,20}$	$0.87_{1,20}$	$0.72_{1,29}$
	NC: A vs. B	$0.30_{1,20}$	$1.09_{1,20}$	$0.84_{1,20}$	$2.34_{1,20}$	$1.22_{1,20}$	$0.01_{1,20}$	$0.0_{1,20}$	$1.55_{1,20}$	$0.18_{1,29}$
	NC: A vs. C	$0.02_{1,20}$	$2.01_{1,20}$	$0.7_{1,20}$	$0.68_{1,20}$	$0.0_{1,20}$	$0.38_{1,20}$	$0.19_{1,20}$	$0.39_{1,20}$	$1.12_{1,29}$
	NC: B vs. C	$0.49_{1.20}$	$0.14_{1.20}$	$0.01_{1.20}$	$0.50_{1,20}$	$1.22_{1.20}$	$0.29_{1.20}$	$0.19_{1,20}$	$0.39_{1,20}$	$0.40_{1.29}$

		Lepidoptera Density	Hymenoptera Density	Homoptera Density	Hemiptera Density	Diptera Density	Coleoptera Density	Formicidae Density
Source	CU vs NC	**$4.36_{1,10}$**	$0.29_{1,10}$	$0.0_{1,10}$	$0.03_{1,10}$	$0.36_{1,10}$	$0.34_{1,10}$	$1.47_{1,10}$
Species Pool	A vs B	**$7.38_{1,20}$ ***	$4.05_{1,20}$	$0.74_{1,20}$	$0.05_{1,20}$	$0.23_{1,20}$	$0.92_{2,20}$	$1.35_{2,20}$
	A vs. C	$2.88_{1,20}$	$1.21_{1,20}$	$0.33_{1,20}$	$0.0_{1,20}$	$0.23_{1,20}$	$0.31_{2,20}$	$0.15_{2,20}$
	B vs. C	$1.04_{1,20}$	$0.84_{1,20}$	$2.06_{1,20}$	$0.05_{1,20}$	$0.0_{1,20}$	$0.11_{1,20}$	$2.40_{1,20}$
Species Pool X source	A: CU vs. NC	$5.53_{1,28.7}$	$0.56_{1,28.4}$	$0.50_{1,16}$	$1.48_{1,28.6}$	$0.43_{1,29.8}$	$2.14_{1,25.8}$	$2.19_{1,28.5}$
	B: CU vs. NC	$0.22_{1,28.7}$	$0.25_{1,28.4}$	$0.00_{1,16}$	$2.31_{1,28.6}$	$0.19_{1,29.8}$	$0.13_{1,25.8}$	$0.08_{1,28.5}$
	C: CU vs. NC	$0.89_{1,28.7}$	$0.06_{1,28.4}$	$0.50_{1,16}$	$0.0_{1,28.6}$	$0.77_{1,29.8}$	$0.13_{1,25.8}$	$0.32_{1,28.5}$
	CU: A vs.B	**$8.31_{1,20}$ ** **	$1.67_{1,20}$	$0.0_{1,20}$	$2.42_{1,20}$	$0.82_{1,20}$	$3.0_{1,20}$	**$3.42_{1,20}$**
	CU: A vs. C	**$3.69_{1,20}$**	$0.07_{1,20}$	$2.64_{1,20}$	$0.39_{1,20}$	$0.05_{1,20}$	$1.69_{1,20}$	$2.62_{1,20}$
	CU: B vs. C	$0.92_{1,20}$	$0.07_{1,20}$	$2.64_{1,20}$	$0.87_{1,20}$	$0.46_{1,20}$	$0.19_{1,20}$	$0.05_{1,20}$
	NC: A vs. B	$0.92_{1,20}$	$2.41_{1,20}$	$1.48_{1,20}$	$1.55_{1,20}$	$0.05_{1,20}$	$0.19_{1,20}$	$0.01_{1,20}$
	NC: A vs. C	$0.23_{1,20}$	$1.67_{1,20}$	$0.66_{1,20}$	$0.39_{1,20}$	$0.21_{1,20}$	$0.75_{1,20}$	$0.38_{1,20}$
	NC: B vs. C	$0.23_{1.20}$	$0.07_{1.20}$	$0.16_{1.20}$	$0.39_{1,20}$	$0.46_{1,20}$	$0.19_{1,20}$	$0.29_{1,20}$

Appendix L. Trophic designations of the macroinvertebrate morphospecies from Carbondale, IL (SICE).

Detritivore	**Herbivore**	**Predator**	**Omnivore**
Sphaeroceridae	Curculionidae 3	*Sergiolus spp.*	Staphylinidae 2
(Diptera)	(Coleoptera)	(Gnaphosidae: Araneae)	(Coleoptera)
Sphaeroceridae 2	Curculionidae 4	Gnaphosidae 2	*Chauliognathes spp.*
(Diptera)	(Coleoptera)	(Araneae)	(Cantharidae: Coleoptera)
Muscidae 1	Curculionidae 5	*Clubiona spp.*	*Formica pallidefulva*
(Diptera)	(Coleoptera)	(Clubionidae: Araneae)	(Formicidae: Hymenoptera)
Muscidae 2	Curculionidae 6	Clubionidae 2	*Formica incerta*
(Diptera)	(Coleoptera)	(Araneae)	(Formicidae: Hymenoptera)
Oniscidea	Curculionidae 7	Lycosidae 1	*Crematogaster spp.*
(Isopoda)	(Coleoptera)	(Araneae)	(Formicidae: Hymenoptera)
	Cicadellidae 1	*Pirata spp.*	*Tetramorium spp.*
	(Hemiptera)	(Lycosidae: Araneae)	(Formicidae: Hymenoptera)
	Cicadellidae 2	Salticidae 1	
	(Hemiptera)	(Araneae)	
	Cicadellidae 3	Salticidae 3	
	(Hemiptera)	(Araneae)	

Cicadellidae 4	Salticidae 4
(Hemiptera)	(Araneae)
Cicadellidae 5	Salticidae 7
(Hemiptera)	(Araneae)
Cercopidae 1	Salticidae 8
(Hemiptera)	(Araneae)
Cercopidae 2	Salticidae 9
(Hemiptera)	(Araneae)
Nymph 1	Salticidae 10
(Hemiptera)	(Araneae)
Membracidae 1	*Marpissa spp.*
(Hemiptera)	(Salticidae: Araneae)
Membracidae 2	*Lariana spp.*
(Hemiptera)	(Araneidae: Araneae)
Delphacidea 1	*Acanthepeira spp*
(Hemiptera)	(Araneida: Araneae)
Delphacidae nymph	*Argiope spp.*
(Hemiptera)	(Araneida: Araneae)

Nymph 3	*Philodromus spp.*
(Hemiptera)	(Philodromidae: Araneae)
Nymph 4	Linyphiidae 1
(Hemiptera)	(Araneae)
Nymph 5	Amaurobiidae
(Hemiptera)	(Araneae)
Melanoplinae 1	*Misumenoides spp.*
(Acrididae: Orthoptera)	(Thomisidae: Araneae)
Melanoplinae 2	*Xysticus spp.*
(Acrididae: Orthoptera)	(Thomisidae: Araneae)
Melanoplinae 3	Miturgidae
(Acrididae: Orthoptera)	(Araneae)
Nemobiinae	*Tibellus spp.*
(Gryllidae: Orthoptera)	(Philodromidae: Araneae)
Phaneropterinae	Mimetidae
(Tettigonidae: Orthoptera)	(Araneae)
Grylllinae	Opiliones
(Gryllidae: Orthoptera)	

Orthopteran Nymph	Chrysopidae (Neuroptera)
Oncopeltus fasciatus	*Tachys spp.* 2
(Lygaeidae: Hemiptera)	(Carabidae: Coleoptera)
Berytidae	Syrphidae 3
(Hemiptera)	(Diptera)
Coreidae	Mutillidae
(Hemiptera)	(Hymenoptera)
Lygaeidae nymph	Chalcidae 1
(Hemiptera)	(Hymenoptera)
Euschistus spp.	Chalcidae 2
(Pentatomidae: Hemiptera)	(Hymenoptera)
Phlaeothripidae	Chalcidae 3
(Thysanoptera)	(Hymenoptera)
Coccoidea (Hemiptera)	Scelionidae (Hymenoptera)
Oebalus pugnax	Dryinidae
(Pentatomidae: Hemiptera)	(Hymenoptera)

Alydus spp.

(Alydidae: Hemiptera)

Pentatomidae Nymph (Hemiptera)

Caterpillar 1

(Lepidoptera)

Caterpillar 2

(Lepidoptera)

Pyrallidae 1

(Lepidoptera)

Brachionidae 3

(Hymenoptera)

Emesinae

(Reduviidae: Hemiptera)

Stenopodainae

(Reduviidae: Hemiptera)

Phymatidae

(Reduviidae: Hemiptera)

Mantodea

Appendix M. Invertebrate abundance from subplot sampled in Belleville, IL (BDE).

	Amaurobiidae 1	Linyphiidae1	Linyphidae 2	Linyphiidae 3	Linyphiidae 4	Linyphiidae 5	Clubionidae 1	Clubionidae 2	Salticidae 1	Salticidae 2	Salticidae 3	Salticidae 4
BDE-1_2	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0
BDE-2_2	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-2_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	6.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-4_2	0.0	3.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	0.0	1.0	0.0
BDE-4_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	1.0	0.0	0.0
BDE-6_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0
BDE-8_2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	1.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-10_4	1.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0

	Salticidae 5	Salticidae (*Hentzia* spp.)	Lycosidae 1	Lycosidae 2	Lycosidae 3	Gnaphosidae 1	Gnaphosidae 2	Araneidae 1	Araneidae 2	Araneidae (*Metazygia* spp.)	Araneidae (*Gea* spp.)	Thomisidae (*Xysticus* spp.)
BDE-1_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	2.0
BDE-4_2	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
BDE-4_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	1.0	1.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	2.0	0.0	0.0	2.0	0.0	4.0	0.0	1.0	0.0	0.0
BDE-6_4	0.0	0.0	4.0	0.0	2.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-7_2	1.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_2	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0
BDE-9_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	4.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0

	(Misumenoides spp.)	Thomisidae *(Corriachne* spp.)	Thomisidae *(Symena* spp.)	Thomisidae *(Misumenoides* spp.)	Oxyopidae	Corinnidae *(Trachelines* spp.)	Philodromidae *(Tibellus* spp.)	Unknown spider 1	Unknown 2	Unknown 3	Opiliones	Berytidae
BDE-1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-4_2	0.0	1.0	1.0	0.0	1.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-4_4	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0

	Myodocha serripes	Pachygronthidae	Lygaeidae 1	Emesinae	Pentatomidae 1	Pentatomidae 2	Pentatomidae 3	Nymph 1	Nymph 2	Nymph 3	Nymph 4	Nymph 5
BDE-1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	3.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-3_2	4.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0
BDE-4_2	12.0	0.0	5.0	0.0	0.0	0.0	0.0	1.0	0.0	4.0	1.0	0.0
BDE-4_4	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
BDE-6_4	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
BDE-8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0

	Unknown Hemipteran	Cicadellinae 1	Cicadellinae 2	Cicadellinae 3	Delphacidae 1	Delphacidae 2	Delphacidae 3	Delphacidae 4	Delphacidae 5	Cercopidae 7	*Prosapia bicincta*	Typhlocybinae 1
BDE-1_2	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	2.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-3_4	0.0	2.0	0.0	2.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-4_2	0.0	1.0	0.0	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	1.0
BDE-4_4	0.0	0.0	0.0	0.0	1.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	1.0	1.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	0.0	2.0	12.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-7_4	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
BDE-8_2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
BDE-8_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-9_2	0.0	4.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
BDE-9_4	0.0	0.0	1.0	4.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	1.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
BDE-10_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Typhlocybinae 2	Typhlocybinae 3	Membracidae 1	Membracida 2	Homoptera Nymph 1	Homoptera Nymph 2	Gryllidae (Nemobiinae)	Tettigonidae (Phaneropterinae)	Tettigonidae (Conocephalinae)	Acrididae (Melanoplinae 1)	Unknown Orthopteran	Muscidae 1
BDE-1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	1.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-4_2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	0.0
BDE-4_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0
BDE-8_2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-8_4	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0

	Muscidae (*Coenosia* spp.)	Cecidomyiidae	Spaeroceridae	Phoridae	Unknown 5	Unknown 6	Tipulidae	Calliphoridae 1	Calliphoridae 2	Tachninidae 1	Chloropidae	Drosophilidae
BDE-1_2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	4.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0
BDE-4_2	0.0	0.0	1.0	6.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
BDE-4_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	1.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0

	Syrphidae 3	Syrphidae 4	Staphylinidae 1	Cantharidae Larvae	*Papillia japonica*	Curculionidae 1	Curculionidae 2	Elateridae 1	Chrysomelidae (*Psylliodes* spp.)	Geocoridae	Coccinellidae 1	Carabidae 1
BDE-1_2	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	3.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0
BDE-4_2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
BDE-4_4	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-5_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_4	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	2.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0

	Carabidae 2	*Zuphium* spp.	Phalacridae	Chrysomelidae (Colapsis spp.)	Chrysomelidae (Diabrotica spp.)	*Tachys* spp.	Caterpillar 3	Pyralidae 1	Pyralidae 2	Brachionidae (*Aleiodes* spp.)	Brachionidae (scelionidae)	Brachionidae Doryctinae (1)
BDE-1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
BDE-4_2	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE-4_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
BDE-7_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0
BDE-10_4	1.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

	Brachionidae 2	Chalcidae	Tetramorium	*Formica incerta*	*Formica pallidefulva*	*Lasius neoniger*	*Ponera pennsylvanica*	*Monomorium* spp.	*Crematogaster* spp.	Pompellidae	Unknown ant 1
BDE-1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_2	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-3_4	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-4_4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-5_2	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
BDE-5_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-6_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-6_4	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0
BDE-7_2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0
BDE-7_4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0
BDE-8_2	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-8_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE-9_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-9_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE-10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
BDE-10_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix N. Plant cover data (%) in each plot (1-10) and subplot (2 and 3) from Belleville, Illinois (BDE)

	Andropogon gerardii	*Sorghastrum nutans*	*Schizachyrium scoparium*	*Elymus canadensis*	*Aster oblongifolus*	*Dalea candida*	*Baptisia leucophea*	*Desmanthus illinoensis*
BDE 1_2	50.0	20.0	6.0	0.0	0.0	0.0	5.0	0.0
BDE 1_4	25.0	32.5	0.0	5.0	0.0	0.0	15.0	8.5
BDE 2_2	50.0	25.0	7.5	2.5	0.0	0.0	6.0	1.5
BDE 2_4	22.5	7.5	4.0	5.0	1.0	0.0	10.0	0.0
BDE 3_2	50.0	35.0	0.0	5.0	0.0	0.0	2.0	2.5
BDE 3_4	27.5	22.5	3.5	7.5	0.0	0.0	12.5	21.0
BDE 4_2	0.0	40.0	20.0	0.0	0.0	0.0	3.5	2.0
BDE 4_4	0.0	40.0	25.0	4.0	1.5	0.0	6.0	5.5
BDE 5_2	50.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 5_4	30.0	17.5	0.0	3.0	0.0	0.0	12.5	7.5
BDE 6_2	50.0	22.5	4.0	0.0	2.0	0.0	0.0	0.0
BDE 6_4	32.5	22.5	0.0	4.0	0.0	0.0	8.5	7.5
BDE 7_2	40.0	40.0	0.0	3.5	0.0	0.0	3.0	0.0
BDE 7_4	35.0	35.0	1.0	5.0	0.0	0.0	7.5	5.0
BDE 8_2	62.5	17.5	2.5	1.5	0.0	0.0	0.0	0.0
BDE 8_4	62.5	20.0	0.0	6.5	0.0	0.0	4.5	6.0
BDE 9_2	60.0	32.5	0.0	0.0	0.0	0.0	5.5	2.5
BDE 9_4	42.5	30.0	1.0	8.0	0.0	0.0	5.5	6.0
BDE 10_2	25.0	25.0	1.5	2.5	0.0	0.0	7.5	0.0
BDE 10_4	25.0	25.0	1.5	6.5	0.0	0.0	10.0	20.0

	Lespedeza capitata	*Liatris pychnostachia*	*Monada fistulosa*	*Oenothera macrocarpa*	*Rudbeckia hirta*	*Solidago speciosa*	*Ambrosia artemesiifolia*	*Ambrosia trifida*
BDE 1_2	0.0	0.0	2.0	0.0	9.0	0.0	0.0	0.0
BDE 1_4	0.0	0.0	12.5	0.0	5.0	0.0	0.0	0.0
BDE 2_2	0.0	0.0	2.5	1.0	4.5	0.0	0.5	0.0
BDE 2_4	1.5	0.0	15.0	3.5	2.5	0.0	1.5	0.0
BDE 3_2	0.0	0.0	0.0	0.0	3.5	0.0	1.0	0.0
BDE 3_4	0.0	0.0	3.0	0.0	6.0	0.0	0.0	0.0
BDE 4_2	1.5	0.0	0.5	0.0	1.5	1.0	1.5	0.0
BDE 4_4	0.0	0.0	3.5	0.0	3.5	0.0	0.0	0.0
BDE 5_2	0.0	0.0	2.5	0.0	5.0	0.0	1.0	0.0
BDE 5_4	0.0	0.0	3.5	7.0	0.0	0.0	0.0	0.0
BDE 6_2	0.0	0.0	1.0	0.0	5.0	0.0	3.0	0.0
BDE 6_4	1.0	0.0	1.5	0.5	4.5	0.0	1.5	1.0
BDE 7_2	0.0	0.0	0.0	0.0	10.0	0.0	2.0	0.0
BDE 7_4	0.5	0.0	1.5	0.0	2.5	0.0	0.0	0.0
BDE 8_2	0.0	0.0	1.5	0.0	4.0	0.0	1.0	0.5
BDE 8_4	0.0	1.5	2.5	0.0	1.0	0.0	0.0	0.0
BDE 9_2	0.0	0.0	0.5	0.0	6.0	0.0	0.0	0.0
BDE 9_4	0.0	0.0	4.0	0.0	4.0	0.0	1.5	0.5
BDE 10_2	0.0	0.0	0.0	0.0	1.0	0.0	3.5	0.0
BDE 10_4	0.0	0.0	0.0	0.0	0.0	0.0	2.5	1.5

	Calystegia sepium	*Desmodium sp.*	*Helianthus mollis*	*Oxalis stricta*	*Solidago canadensis*	*Taraxicum officinale*	*Digitaria sanguinalis*	*Stellaria sp.*
BDE 1_2	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0
BDE 1_4	1.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0
BDE 2_2	1.5	7.5	0.0	0.5	0.0	0.0	0.0	0.5
BDE 2_4	0.0	2.0	0.0	0.0	0.0	0.0	15.0	0.0
BDE 3_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
BDE 3_4	0.0	2.5	0.0	0.5	0.0	0.5	0.0	0.5
BDE 4_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 4_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 5_2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
BDE 5_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 6_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 6_4	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.5
BDE 7_2	0.0	10.0	0.0	0.0	0.5	0.0	0.0	0.0
BDE 7_4	0.5	6.0	0.0	0.5	0.0	0.0	0.0	1.0
BDE 8_2	0.5	25.0	0.0	0.5	0.0	0.0	0.0	0.0
BDE 8_4	0.0	5.0	1.5	0.0	0.0	0.0	0.0	00.
BDE 9_2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.5
BDE 9_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
BDE 10_2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.5
BDE 10_4	0.0	1.5	0.0	0.0	0.5	0.0	0.0	0.5

	Ipomea	*Eryngium yuccifolium*	*Solanum carolina*	*Stellaria*	*Kuhnia*	*Cassia*	*Polygonum spp*	*Panicum virgatum*
BDE 1_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 1_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 2_2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 2_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 3_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 3_4	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 4_2	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
BDE 4_4	0.0	0.0	0.5	0.5	1.0	0.0	0.0	0.0
BDE 5_2	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
BDE 5_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 6_2	0.5	0.0	1.5	1.0	0.0	1.0	0.0	0.0
BDE 6_4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 7_2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 7_4	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
BDE 8_2	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0
BDE 8_4	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
BDE 9_2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 9_4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BDE 10_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
BDE 10_4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0

	Unknown 1	*Apocynum cannabinum*
BDE 1_2	0.0	0.0
BDE 1_4	0.0	0.0
BDE 2_2	0.0	0.0
BDE 2_4	0.0	0.0
BDE 3_2	0.0	0.0
BDE 3_4	0.0	0.0
BDE 4_2	0.0	0.0
BDE 4_4	0.0	0.0
BDE 5_2	0.0	0.0
BDE 5_4	0.0	0.0
BDE 6_2	0.0	0.0
BDE 6_4	0.0	0.0
BDE 7_2	0.0	0.0
BDE 7_4	0.0	0.0
BDE 8_2	0.0	0.0
BDE 8_4	0.0	0.0
BDE 9_2	0.0	0.0
BDE 9_4	0.0	0.0
BDE 10_2	0.5	0.0
BDE 10_4	0.0	1.5

Appendix O. Summary of statistical results (F values with degrees of freedom as subscripts) for main effects of dominant grass population source (S= population source [CU= cultivar, NC= Non cultivar]) and Diversity treatment (High and Low), and their interaction on invertebrate abundances from Belleville, IL (BDE).

		Total Invertebrate Abundance	Diversity (H')	Richness	Predator Density	Omnivore Density	Herbivore Density	Detritivore Density	Aranea Density	Orthoptera Density
Source	CU vs. NC	$0.15_{1,8}$	$3.27_{1,8}$	$0.14_{1,8}$	$0.02_{1,8}$	$0.01_{1,8}$	$0.76_{1,8}$	$0.13_{1,8}$	$0.05_{1,8}$	$0.32_{1,8}$
Species Pool	High vs. Low	$2.85_{,1,8}$	$0.99_{,1,8}$	$2.61_{,1,8}$	$\mathbf{5.81_{,1,8}}$ **	$0.56_{,1,8}$	$2.12_{,1,8}$	$0.4_{1,8}$	$1.97_{,1,8}$	$2.89_{,1,8}$
Species Pool	Low: CU vs. NC	$0.03_{1,12.7}$	$2.39_{1,16}$	$1.31_{1,15.6}$	$0.01_{1,13.7}$	$0.15_{1,14.9}$	$0.03_{1,14.7}$	$0.10_{1,12.8}$	$0.06_{1,16}$	$0.07_{1,12.7}$
X source	High: CU vs. NC	$0.74_{1,12.7}$	$1.13_{1,16}$	$0.33_{1,15.6}$	$0.03_{1,13.7}$	$0.07_{1,14.9}$	$2.45_{1,14.7}$	$0.90_{1,12.8}$	$0.01_{1,16}$	$0.29_{1,12.7}$
	CU: Low vs. High	$0.20_{1,8}$	$0.21_{1,8}$	$0.04_{1,8}$	$3.08_{1,8}$	$0.02_{1,8}$	$0.0_{1,8}$	$0.20_{1,8}$	$0.83_{1,8}$	$1.79_{1,8}$
	NC: Low vs. High	$3.75_{1,8}$	$0.90_{1,8}$	$\mathbf{4.32_{1,8}}$	$2.70_{1,8}$	$0.83_{1,8}$	$\mathbf{4.24_{1,8}}$	$1.80_{1,8}$	$1.15_{1,8}$	$1.14_{1,8}$

		Lepidoptera Density	Hymenoptera Density	Homoptera Density	Hemiptera Density	Diptera Density	Coleoptera Density	Formicidae Density
Source	CU vs. NC	$4.90_{1,8}$	$0.01_{1,8}$	$1.62_{1,8}$	$0.38_{1,8}$	$0.01_{1,8}$	$0.01_{1,8}$	$0.03_{1,8}$
Species Pool	High vs. Low	$0.17_{,1,8}$	$0.36_{,1,8}$	$1.81_{,1,8}$	$0.90_{,1,8}$	$1.24_{,1,8}$	$1.24_{,1,8}$	$0.41_{,1,8}$
Species Pool	Low: CU vs. NC	$2.25_{1,15.1}$	$0.07_{1,13.6}$	$0.08_{1,13}$	$0.0_{1,16}$	$0.67_{1,15.9}$	$0.67_{1,15.9}$	$0.07_{,15.3}$
X source	High: CU vs. NC	$4.0_{1,15.1}$	$0.15_{1,13.6}$	$\mathbf{3.68_{1,13}}$	$0.67_{1,16}$	$0.91_{1,15.9}$	$0.91_{1,15.9}$	$0.29_{1,15.3}$
	CU: Low vs. High	$0.0_{1,8}$	$0.0_{1,8}$	$0.04_{1,8}$	$0.09_{1,8}$	$0.020_{1,8}$	$0.02_{1,8}$	$0.0_{1,8}$

NC: Low vs High	$0.33_{1,8}$	$0.71_{1,8}$	$\mathbf{4.39_{1,8}}$	$1.10_{1,8}$	$2.95_{1,8}$	$2.95_{1,8}$	$0.81_{1,8}$

Appendix P. Trophic designations of the macroinvertebrate morphospecies from Belleville, IL (BDE).

Detritivores	**Herbivores**	**Predators**	**Omnivores**
Muscidae 1 (Diptera)	Berytidae (Hemiptera)	Amaurobiidae 1 (Araneae)	Geocoridae (Hemiptera)
Sphaeroceridae (Diptera)	*Myodocha serripes* (Rhyparochromidae: Hemiptera)	Linyphiidae1 (Araneae)	*Tetramorium spp.* (Formicidae: Hymenoptera)
Calliphoridae 1 (Diptera)	Pachygronthidae (Hemiptera)	Linyphidae 2 (Araneae)	*Formica incerta* (Formicidae: Hymenoptera)
Calliphoridae 2 (Diptera)	Lygaeidae 1 (Hemiptera)	Linyphiidae 3 (Araneae)	*Formica pallidefulva* (Formicidae: Hymenoptera)
	Pentatomidae 1 (Hemiptera)	Linyphiidae 4 (Araneae)	*Monomorium spp.* (Formicidae: Hymenoptera)
	Pentatomidae 2 (Hemiptera)	Linyphiidae 5 (Araneae)	*Crematogaster spp.* (Formicidae: Hymenoptera)
	Pentatomidae 3 (Hemiptera)	Clubionidae 1 (Araneae)	
	Nymph 1 (Hemiptera)	Clubionidae 2 (Araneae)	
	Nymph 2 (Hemiptera)	Salticidae 1 (Araneae)	
	Nymph 3 (Hemiptera)	Salticidae 2 (Araneae)	
	Nymph 4 (Hemiptera)	Salticidae 3 (Araneae)	
	Nymph 5 (Hemiptera)	Salticidae 4 (Araneae)	
	Cicadellinae 1 (Cicadellidae: Hemiptera)	Salticidae 5 (Araneae)	

Cicadellinae 2
(Cicadellidae: Hemiptera)

Cicadellinae 3
(Cicadellidae: Hemiptera)

Delphacidae 1
(Hemiptera)

Delphacidae 2
(Hemiptera)

Delphacidae 3
(Hemiptera)

Delphacidae 4
(Hemiptera)

Delphacidae 5
(Hemiptera)

Cercopidae 7
(Hemiptera)

Prosapia bicincta
(Cercopidae: Hemiptera)

Typhlocybinae 1
(Cicadellidae: Hemiptera)

Typhlocybinae 2
(Cicadellidae: Hemiptera)

Typhlocybinae 3
(Cicadellidae: Hemiptera)

Hentzia spp.
(Salticidae: Araneae)

Lycosidae 1
(Araneae)

Lycosidae 2
(Araneae)

Lycosidae 3
(Araneae)

Gnaphosidae 1
(Araneae)

Gnaphosidae 2
(Araneae)

Araneidae 1
(Araneae)

Araneidae 2
(Araneae)

Metazygia spp.
(Araneidae: Araneae)

Gea spp.
(Araneidae: Araneae)

Xysticus spp.
(Thomisidae:Araneae)

Misumenoides spp.
(Thomisidae: Araneae)

Membracidae 1
(Hemiptera)

Membracida 2
(Hemiptera)

Homopteran Nymph 1
(Hemiptera)

Homopteran Nymph 2
(Hemiptera)

Nemobiinae
(Gryllidae: Orthoptera)

Phaneropterinae
(Tettigonidae: Orthoptera)

Conocephalinae
(Tettigonidae: Orthoptera)

Melanoplinae 1
(Acrididae: Orthoptera)

Unknown Orthopteran

Corriachne spp.
(Thomisidae:Araneae)

Symena spp.
(Thomisidae:Araneae)

Misumenoides spp.
(Thomisidae:Araneae)

Oxyopidae
(Araneae)

Tracheline spp.
(Corinnidae:Araneae)

Tibellus spp.
(Philodromidae: Araneae)

Unknown spider 1
(Araneae)

Unknown 2
(Araneae)

Unknown 3
(Araneae)

Cecidomyiidae (Diptera)

Chloropidae (Diptera)

Drosophilidae (Diptera)

Papillia japonica (Scarabaeidae: Coleoptera)

Curculionidae 1 (Coleoptera)

Curculionidae 2 (Coleoptera)

Elateridae 1 (Coleoptera)

Psylliodes spp. (Chrysomelidae: Coleoptera)

Phalacridae (Coleoptera)

Colaspis spp. (Chrysomelidae: Coleoptera)

Diabrotica spp. (Chrysomelidae: Coleoptera)

Caterpillar 3 (Lepidoptera)

Pyralidae 1

Opiliones

Emesinae (Reduviidae: Hemiptera)

Coenosia spp. Muscidae: Diptera)

Tachninidae 1 (Diptera)

Syrphidae 3 (Diptera)

Syrphidae 4 (Diptera)

Staphylinidae 1 (Coleoptera)

Cantharidae Larvae (Coleoptera)

Coccinellidae 1 (Coleoptera)

Carabidae 1 (Coleoptera)

Carabidae 2 (Coleoptera)

Zuphium spp. (Carabidae: Coleoptera)

Tachys spp.

(Lepidoptera)

Pyralidae 2
(Lepidoptera)

(Carabidae: Coleoptera)

Aleiodes spp.
(Brachionidae: Hymenoptera)

Scelionidae
(Brachhionidae:Hymenoptera)

Doryctinae
(Brachhionidae:Hymenoptera)

Brachionidae 2
(Hymenoptera)

Chalcididae
(Hymenoptera)

Ponera pennsylvanica
Formicidae: Hymenoptera)

Pompilidae
(Hymenoptera)

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